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Virtual Web Counselling Application

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VIRTUAL WEB COUNSELLING APPLICATION

A graduate project submitted to Dakota State University in partial fulfillment of the requirements for the degree of

Master of Science

in

Information Systems

July, 2012

By
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Project Committee:

Dr. Ronghua Shaan
Dr. Michael Tu
Dr. Stephen Krebsbach

DAKOTA STATE UNIVERSITY

PROJECT APPROVAL FORM

We certify that we have read this project and that, in our opinion, it is satisfactory in scope and quality as a project for the degree of Master of Science in Information Systems.

Student Name: Satish Ekambaram

Master's Project Title: Virtual Web Counseling Application

Faculty supervisor: Ronghua Shan Date: 7/26/12

Committee member: [signature] Date: 7/26/12

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Faculty supervisor: Dr. Ronghua Shan Date: July-25-2012

Committee member: Dr. Michael Tu Date: July-25-2012

Committee member: Dr. Stephen Krebsbach Date: July-25-2012

ACKNOWLEDGMENT

I would like to thank Dr. Ronghua Shan for giving me excellent guidance to complete this project successfully. I would also like to thank my Committee members Dr.Stephen Krebsbach & Dr. Michael Tu for helping me throughout the project. The advanced MSIS coursework at Dakota State University provided me with required knowledge in timely completion of this project.. The supportive MSIS faculty at Dakota state University helped me gain the technical expertise required for the successful completion. Finally, I would like to thank my parents for supporting me at each and every part of life and giving me valuable suggestions.

ABSTRACT

Students planning to pursue higher education often require researching various factors and the available option for getting into Universities based on their test score. At the same time Universities or Educational Institutions need a real time system which is capable of keeping track of data like the number of students applied and their individual details. The main idea of this project is to develop a web application as a solution for the above stated problems. The main purpose of this project is to create an application which acts as a standalone web interface between the prospective students and the educational institutions. This project eliminates the need for the student to personally visit the university to find out the real time availability of the admissions.

It is very common for universities to develop a web application and host it on one of their servers and make it available to the users. The problems with this approach is the amount of resources required, high maintenance and setup cost, skilled professional to maintain, crash and error prone data storage etc. The application is required for the institutions only a few times a year and it will sit idle all the rest. With the advances in technology and the availability of concepts like Cloud computing it is very optimal to create software as a service and host it a third party server and access it when required. This provides a very cost effective and highly efficient solution for all the problems stated above.

This current project is an attempt to integrate both cloud and web counselling application which indirectly results in overcoming the above discussed problems. This project is proposed to isolate problems that are associated to the existing system and improvise the entire counselling process to a better efficient one.

DECLARATION

I hereby certify that this project constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions or writings of another.

I declare that the project describes original work that has not previously been presented for the award of any other degree of any institution.

Signed,

Satish Ekambaram.

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CHAPTER 1

INTRODUCTION

1.1 Background of the Problem

In the present scenario the university needs to manage admissions of huge number of students into different colleges that are affiliated with it. In order to proceed with the admission process the university holds a counselling which can run as long as a month for every student. In this situation the student need to travel all the way to the university to attend the counselling which sometimes takes longer than two days to a week. Not only for the students, but the university need to invest huge amount of money on buying different resources to process and maintain the heavy inflow of student data. This project addresses the stated problems and provides a possible solution that can overcome issues by creating a web counselling application through which the students can attend the counselling procedure though internet and the university can avoid the maintenance cost by having the application deployed in to cloud by making use of the advance cloud computing technology.

1.2 Statement of the problem

This project is to implement a system where we create a virtual web counselling application and then transfer it from a static view to a virtual cloud which is finally achieved by implementing the current project.

1.3 Objectives of the project

The deliverables of the current project will be creating an application for Web counselling using .Net, and then creating a machine image which will further be deployed on any Cloud providers (for example: Amazon Cloud or IBM Cloud). This current project is an attempt to integrate both cloud and web counselling application which indirectly results in overcoming the above discussed problems.

CHAPTER 2

LITERATURE REVIEW

Implementing a web application and then deploying the application in the cloud is the most efficient solution that I came across after researching and reviewing various articles and concepts. This also turns out to be cost effective and less resource oriented solution.

Developing a web application in .Net framework as a front end will provide a solution with the created application is faster and optimal. The features of .Net Framework provides the web counselling application the efficiency it needs without having a delayed response time. Deploying the application in cloud would be a better solution to reduce the initial cost spent on servers and maintenance cost. In general cloud computing can be defined as a service provided to the client through internet, where the client pays for the service either on hourly basis or size of the data used. It is basically providing the software as a service for the client.

2.1 Existing System

In present scenario students need to physically attend the counselling process based on their test scores or the ranks achieved and sometimes the wait time would be more than a day. Students in rural areas need to travel long distance to attend the counselling procedure even at critical health condition. In additional to the above problem the university requires huge initial cost to buy servers and maintain large data house to maintain data related to millions of students each year. Also a crash and recovery of the servers' cannot be predicted which can be a huge problem in the existing system. Huge increase in expenditure for purchasing different servers, software's and increases of maintenance cost for these servers and database can also be considered as the major disadvantage of the existing system.

2.2 Proposed System

The proposed system not only addresses the above discussed problems in the existing system but also makes the entire counselling procedure an efficient workflow system. To overcome these problems we need a web application where students can attend the counselling through internet. In order to avoid unnecessary delay in servers and to minimize the flaws that exist in due to the drawbacks of the current system, there comes a need to use an environment which allows 'Pay per Use' infrastructure for the university to deploy their applications and use throughout the world via internet. This initiates requirement of a cloud, where the university will no longer invest on premise technology and application. In order to achieve this, the university needs to invest on growing array of an on demand service like cloud computing where we transfer our application from static view to a virtual cloud for which we can use different cloud providers like Amazon EC2 or IBM cloud.

2.3 Cloud Computing

Cloud computing is an on demand service, where the service is hosted through internet. So to isolate the problem of investing huge money on servers the university need to invest on cloud computing which indeed results in competitive advantages and this is true because innovation in technology has changed our daily life in particular if we see in IT; new technologies are emerging like virtualization and distributed computing .

A cloud service has three distinct characteristics that differentiate it from traditional hosting of applications. It is sold as on demand service, it is "pay per hour or monthly", secondly it is elastic because a user can limit or demand for more server at any given time; and finally the service is fully managed by cloud providers due to which the user doesn't need to have any knowledge or control over the infrastructure they use.

2.4 Amazon EC2

Amazon EC2 is a web service which can be used by clients to setup and manage their server instances into Amazon data center using different utilities and tools provided by amazon. The major functionality of Amazon EC2 is to present the virtual computing environment, which allows the user to use the web service interface and setup his server

instance with different custom options like different operating systems; different application environments and can also manage network access permissions.

Based on the usage of the service, one can create or delete as many as server instances on Amazon EC2 at any particular time. The size and configuration of instance can be varied from one instance to other based on their specific needs. For example, if a user wants to create or manage small instance it requires one Amazon EC2 compute unit but for instance with dedicated database server and application it require more than ten Amazon EC2 compute units.

Amazon EC2 provides high flexibility to the user to use only the capacity they require for their service which by default eliminates the need of purchasing large and expensive hardware, also it allow the users to forecast traffic, and then enables them to immediately deal with changes in requirements of their application or service.

Amazon EC2 provides the flexibility of selecting different instance types, operating system, storage size, speed and hardware or software options for a user. It also provides the flexibility of selecting spot instance which is basically scalability based on the application load the number of instance can be increased or decreased. It also allows the user to automatically scale the capacity of EC2 instance to maintain the performance of the application even at high loads. In additional, amazon also provides a high security for our computing resource. It associates firewall setting to control network access between its instances and elastic ip address feature to limit the access of EC2 instance within certain range.

2.5 Amazon Machine Image (AMI)

Amazon Machine Image is an encrypted machine image with pre-configured operating systems and virtual software's which are used to create virtual servers in Amazon EC2. This AMI is required to boot instance of an application and will operate as a basic unit of deployment for the services that are delivered through amazon elastic compute cloud [1].

Amazon EC2 provides a huge selection of AMIs which varies on their configuration (OS, software's, storage space, security, speed) and will be selected based on the functionality of application that is deployed into it. In general, every AMI instance will be classified into three types (micro, small, and high-cpu) which basically differs on their performance, usage

size, usage price and the number of in instance required. Every AMI created will then be associated with security group, network access and browsing configuration which are later used as authentication for the users who access the application deployed in it.

Hardware Requirements:

- Processor : Pentium IV
- Hard Disk : 80GB
- RAM : 512MB
- Additional Requirements :Internet connection

Software Requirements:

- Operating System: Any Windows version with .NET framework
- Programming: HTML,C# and Asp.NET
- Virtual Server: IBM Cloud or Amazon EC2
- Data Base: Microsoft SQL Server

CHAPTER 3

SYSTEM DESIGN

System design is the process of identifying subsystems and the dependencies that occurs between these subsystems. System design defines the architecture, system components and deciding the data management strategy.

3.1 System Architecture

In this project the application developed will be hosted on a dedicated server where the users access it through its corresponding domain URL. The application is designed using the client server architecture where it uses middleware to service the data request between client and database in server.

The web counselling application uses multi-tier architecture in which the architecture designs the software applications based on a layered model by explaining the importance of each layer and its relationship with other layers. So here by using this multi-tier architecture we logically separate the presentation, application and the data management layer which ultimately result in developing a high performance application as each layer act independently of others.

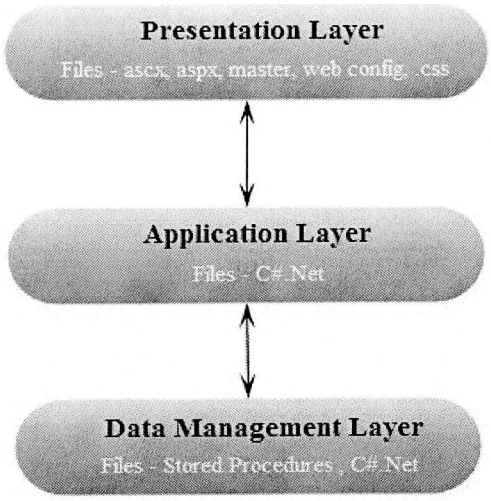

Figure 1, Multi –Tier Architecture.

In Figure 1 the architecture consists of three different layers presentation layer, application layer and the data base layer. Communication between the presentation and database layer is through the network protocols and the presentation layer is represented using a graphical user interface. In the multi-tier architecture the front end (presentation layer) at the client side is a user interface which will be running in a web browser and the back end is a database which will be located on the cloud servers.

3.1.1 Presentation Layer

As the name indicates it is the user interface layer where the user interacts with the application and proper response is provided as output after processing the user's request. In this project the user interface is a web site which can be available on client's side web browser. The application is developed using C# as its codec behind language and ASP.Net to design its user interface.

3.1.2 Application Layer

This layer is also known as business layer and acts as a communication between the presentation and the database layers. As the application or business logic is processed in this layer it is considered as the important layer in the architecture. In this project we use C# to

develop the application logic as it is a much simpler object oriented language when compared with other object oriented languages.

3.1.3 Database or Data Management Layer

This Layer is considered as the storage point of the application as it has a database located in it. In this project we use Microsoft SQL server 2012 as data base to store information that is entered by the user in presentation layer. Each Data base layer consists of Data Base Management System (DBMS) which is mainly used for accessing the data in the data base serve. In a software application a request is sent from the application layer to the DBMS in data base layer which later is processed by DBMS and the requested data is sent back to the application layer which is displayed to the user in the presentation layer.

Below is the system architecture which depicts the process flow of the project

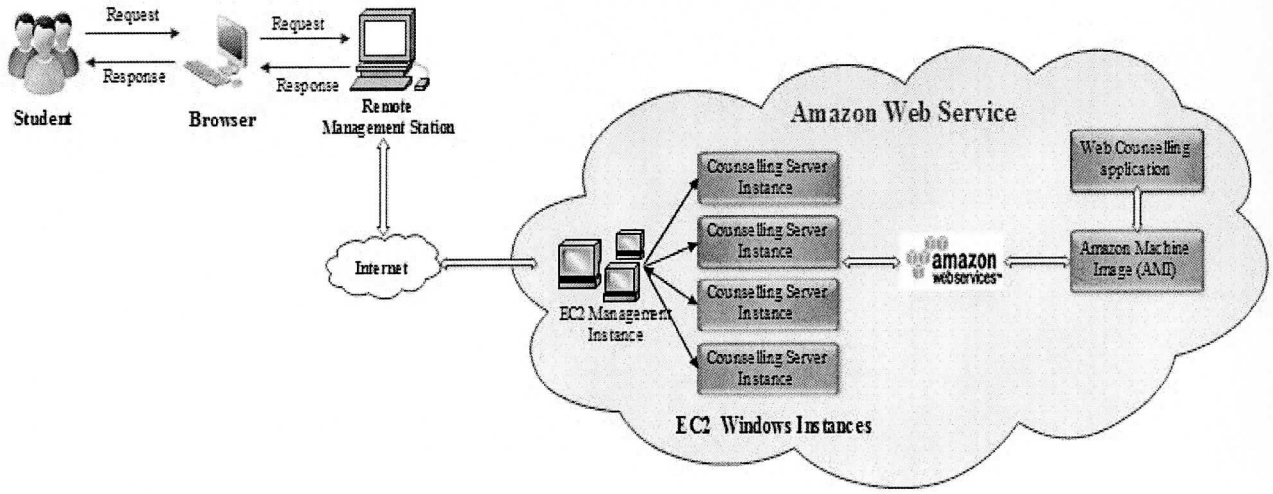

Figure 2 : Virtual Web Counselling System Architecture.

3.2 Project Modules

Module 1: Creating Web Counselling Application

This module deals with the creation of web counselling application which serves as a user interface for students throughout the counselling procedure. To create the application we use asp.net to design user interfere (UI) for students and then c#.net code to create the application logic.

Functionalities in Module 1:

1) After successful authentication into the web application, the users are provided with a user interface to select the options for counselling.

Each page in this application is designed with rich styled controls which are more users friendly and will take input from the user, process the requested input and finally return the output.

2) Data collection & college allotment

Each page takes particular details as input from the user like interested districts, colleges, branches and submits the user selected list to the database where it is stored and then allots the student with their requested college and branch.

Below is the details work flow of the web counselling application for a student.

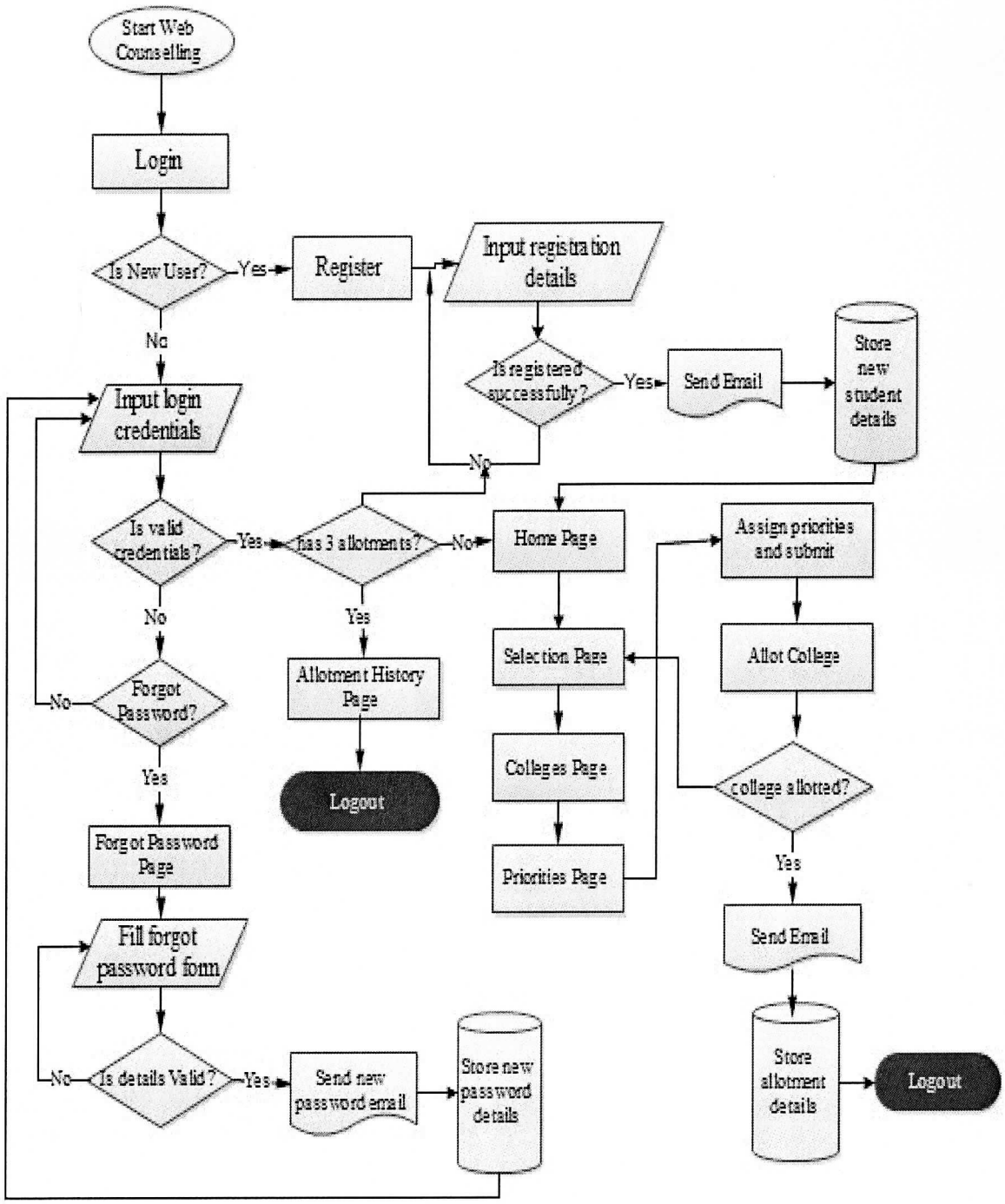

Figure 3 : Web Counselling work flow.

Module 2: Creating AMI

In this module we will be creating an amazon machine image for the application created in module 1. An Amazon Machine Image (AMI) is a packed up environment in amazon elastic cloud EC2 which includes necessary software's to create and boot the instance of application [2].

Module 3: Deploying in the application

In this module we will deploy the created application in Amazon EC2 Cloud. At the time of deploying the application we provide the public DNS name which was assigned while creating AMI as the application service URL publish application to EC2 instance.

Module 4: Accessing the application

The application will now be on the cloud available to all. We can access the application by the service URL specified while publishing the application. Once the domain name is created, the users can access with the corresponding URL.

3.3 Database Design for Web Counselling Application

Database or the backend design is one of the crucial factors to achieve the scalability of an application. The ER diagram for the web counselling application was using its database table and is shown below.

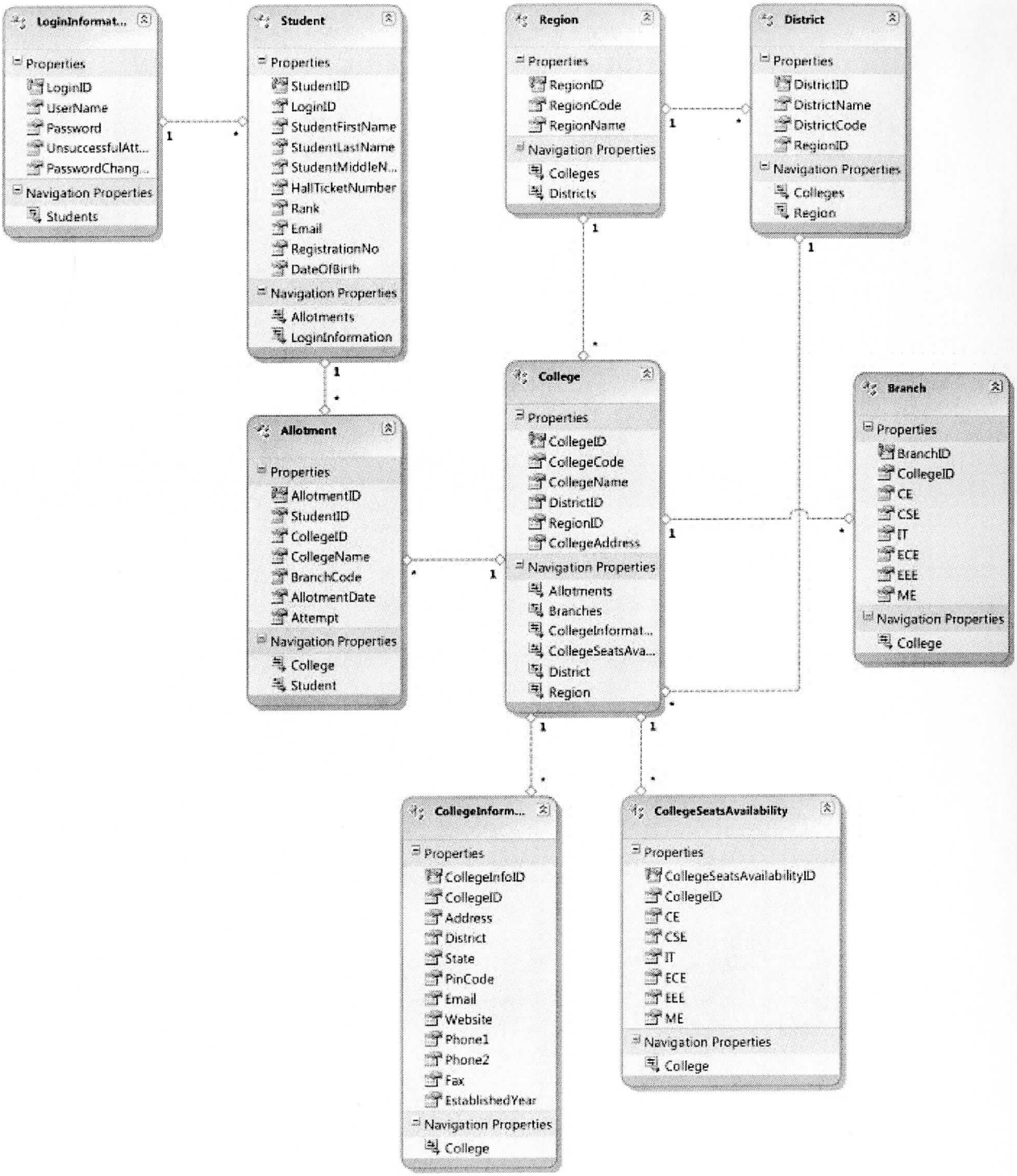

Figure 4 : ER diagram of web counselling

3.4 Data Dictionary

3.4.1 Allotment

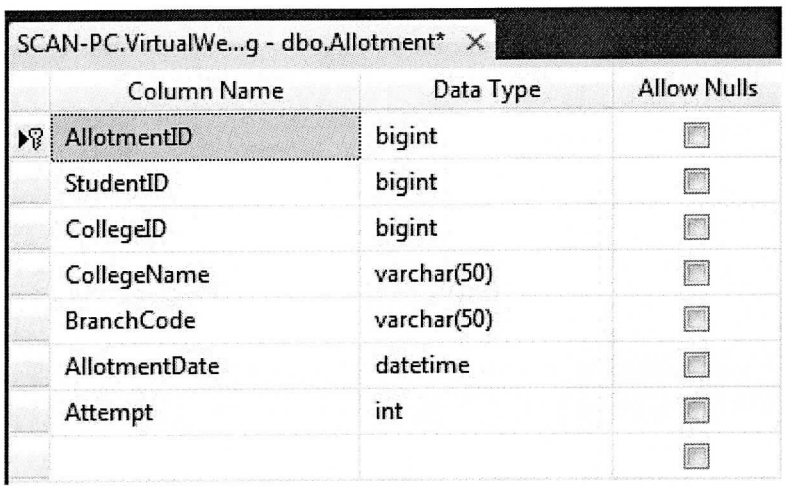

Figure 5 : Allotment Table

Allotment table stores information about college and branch allotted to a student. Each time a new allotment is added, in addition to information like AllotmentID (primary key), college name and branch the table also store information like allotment date, attempt (no of time the student has been allotted a college), StudentID and CollegeID where StudentID and CollegeID are foreign key which are referenced by tables named student and college.

3.4.2 Branch Codes

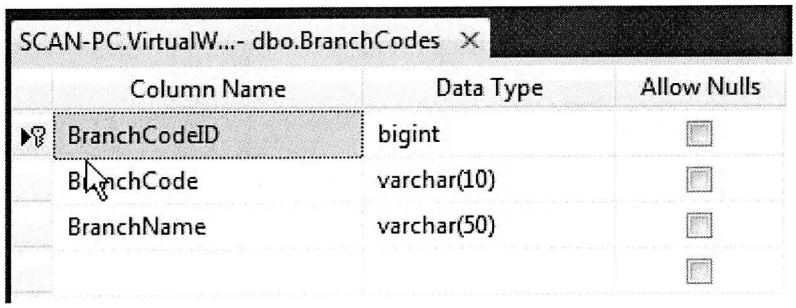

Figure 6 : Branch Codes Table

Branch Codes table stores information like branch name and its respective code. Each column in branch codes table will not allow any null values to be inserted into a record.

3.4.3 Branches

SCAN-PC.VirtualWe...ing - dbo.Branches

Column Name	Data Type	Allow Nulls
BranchID	bigint	☐
CollegeID	bigint	☐
CE	bigint	☐
CSE	bigint	☐
IT	bigint	☐
ECE	bigint	☐
EEE	bigint	☐
ME	bigint	☐
		☐

Figure 7 : Branches Table

Branches table stores information about current number of seats available in each branch of a college. Each row in branches table stores CollegeID (Foreign key) which refers to a college in college table.

3.4.4 College Information

SCAN-PC.VirtualWe...ollegeInformation

Column Name	Data Type	Allow Nulls
CollegeInfoID	bigint	☐
CollegeID	bigint	☐
Address	nchar(100)	☐
District	varchar(50)	☐
State	varchar(50)	☐
PinCode	varchar(10)	☐
Email	varchar(50)	☐
Website	varchar(50)	☐
Phone1	varchar(15)	☐
Phone2	varchar(15)	☐
Fax	varchar(15)	☐
EstablishedYear	varchar(10)	☐
		☐

Figure 8 : College Information Table

College Information table stores information like college address, contact information, phone number, fax number, email, website information and finally the year in which the college was established. Similar to branches table each row in college information table store CollegeID which acts as foreign key and refers a college in college table. Also neither of the columns in college information table will allow null values to be inserted into its records.

3.4.5 Colleges

SCAN-PC.VirtualWe...ing - dbo.Colleges

Column Name	Data Type	Allow Nulls
CollegeID	bigint	☐
CollegeCode	varchar(10)	☐
CollegeName	varchar(100)	☐
DistrictID	bigint	☐
RegionID	bigint	☐
CollegeAddress	nchar(100)	☑
		☐

Figure 9 : Colleges Table

College table stores some basic information like college name, college code, college address and id's of districts and region in which it is located. Here DistrictID and RegionID are two foreign key columns which are referred to columns DistrictID and RegionID in district and region table.

3.4.6 College Seats Availability

SCAN-PC.VirtualWeb...eSeatsAvailability

Column Name	Data Type	Allow Nulls
CollegeSeatsAvailabilityID	bigint	
CollegeID	bigint	
CE	bigint	
CSE	bigint	
IT	bigint	
ECE	bigint	
EEE	bigint	
ME	bigint	

Figure 10 : College Seats Availability Table

In this table the total number of seats available in each branch of a particular college is stored. Here each row stores CollegeID to refer a particular college in college table.

3.4.7 Districts

SCAN-PC.VirtualWeb...ing - dbo.Districts

Column Name	Data Type	Allow Nulls
DistrictID	bigint	
DistrictName	varchar(50)	
DistrictCode	varchar(50)	
RegionID	bigint	

Figure 11 : Districts Table

Districts table store stores information like district name district code and RegionID (Foreign Key reference RegionID in Region table) of each and every district located in that state.

3.4.8 Login Information

SCAN-PC.VirtualWe....LoginInformation

Column Name	Data Type	Allow Nulls
LoginID	bigint	☐
UserName	varchar(50)	☑
Password	varchar(50)	☐
UnsuccessfulAttempts	int	☐
PasswordChanged	bit	☑
		☐

Figure 12 : Login Information Table

Login information table as name refers stores basic information like students username password, the number of unsuccessful attempts made and finally password value. In this application each time the user enters wrong user credentials the value of unsuccessful attempts will be increased by one and once the value reaches a maximum of three that particular student account will be locked. Later the student needs to reset his password.

3.4.9 Regions

SCAN-PC.VirtualWe...ling - dbo.Regions

Column Name	Data Type	Allow Nulls
RegionID	bigint	☐
RegionCode	varchar(50)	☐
RegionName	varchar(50)	☐
		☐

Figure 13 : Regions Table

Regions table store information like region name and region code of each region located in that state. Here each column in this table will not allow any null values to be stored in its records.

3.4.10 10. Student

SCAN-PC.VirtualWe...ling - dbo.Student

Column Name	Data Type	Allow Nulls
StudentID	bigint	☐
LoginID	bigint	☐
StudentFirstName	varchar(50)	☐
StudentLastName	varchar(50)	☐
StudentMiddleName	varchar(50)	☑
HallTicketNumber	varchar(15)	☐
Rank	varchar(10)	☐
Email	varchar(50)	☐
RegistrationNo	varchar(50)	☐
DateOfBirth	date	☐
		☐

Figure 14 : Students Table

Student table stores information like student name, student date of birth, student email, rank, hall ticket number, registration number. Also each column in this table stores LoginId (Foreign Key) which refers to the login information of that student in login table. Except the column student middle name in this table no other columns will accept any null values to be stored in its records.

3.4.11 Counselling Schedule

SCAN-PC.VirtualWe...unsellingSchedule

Column Name	Data Type	Allow Nulls
CounsellingScheduleID	bigint	☐
CounsellingPhaseNo	bigint	☐
MinRank	varchar(50)	☐
MaxRank	varchar(50)	☐
ScheduleStartDate	datetime	☐
ScheduleEndDate	datetime	☐
		☐

Figure 15 : Counselling Schedule Table

This table stores day to day schedule information and rank information for each phase of counselling. In particular, this table stores information like counselling phase number, minimum and maximum rank and the start and end date of counselling phase.

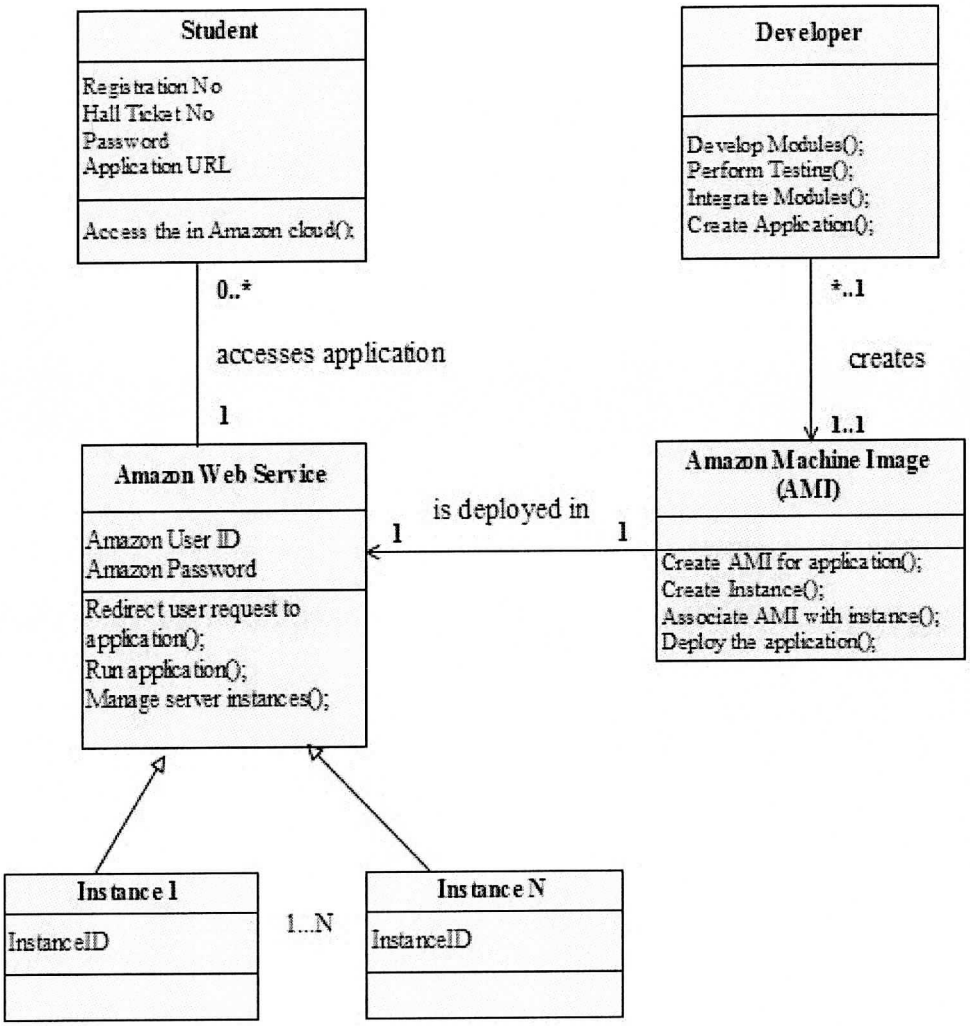

Figure 16 : Class Diagram for entire virtual web counselling system.

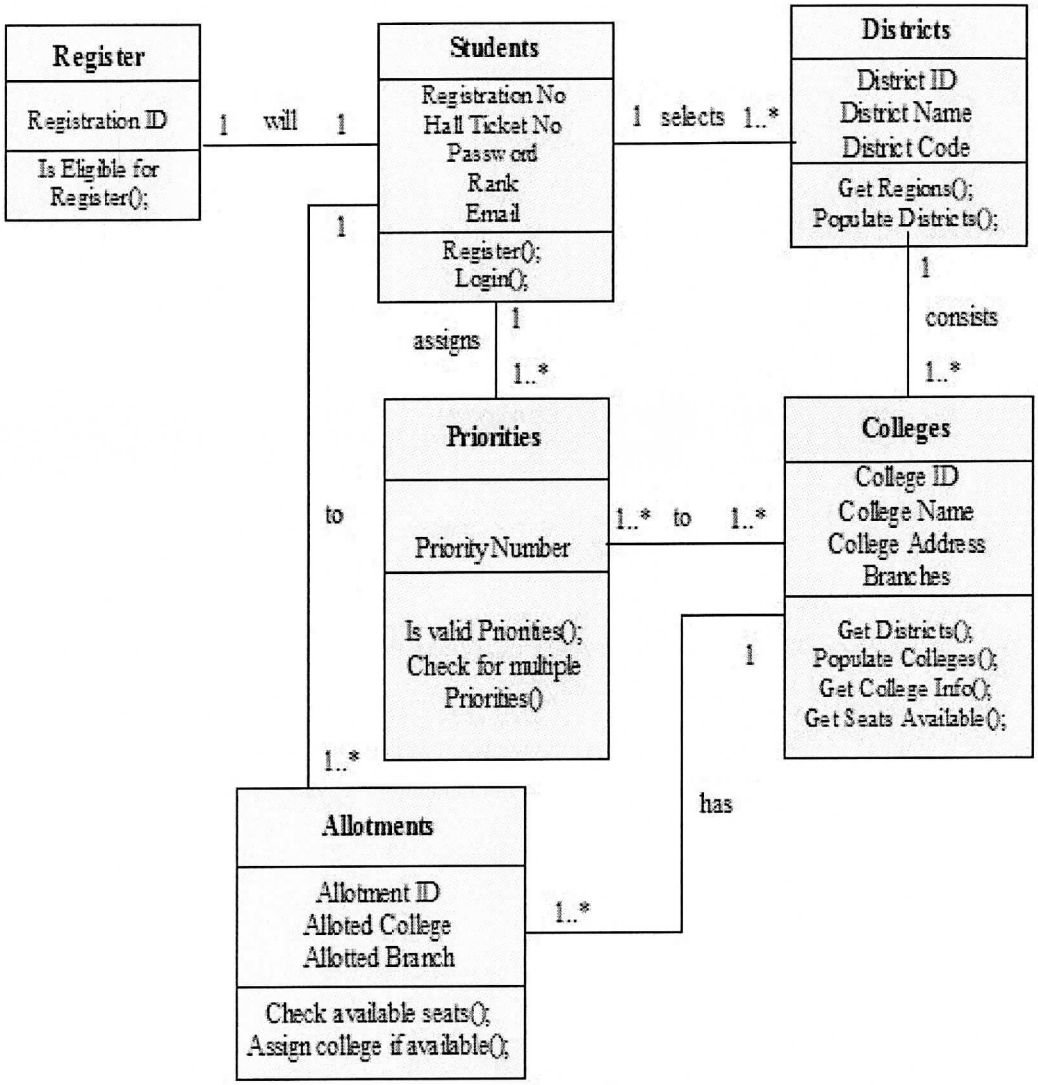

Figure 17 : Class diagram of student's web counselling application.

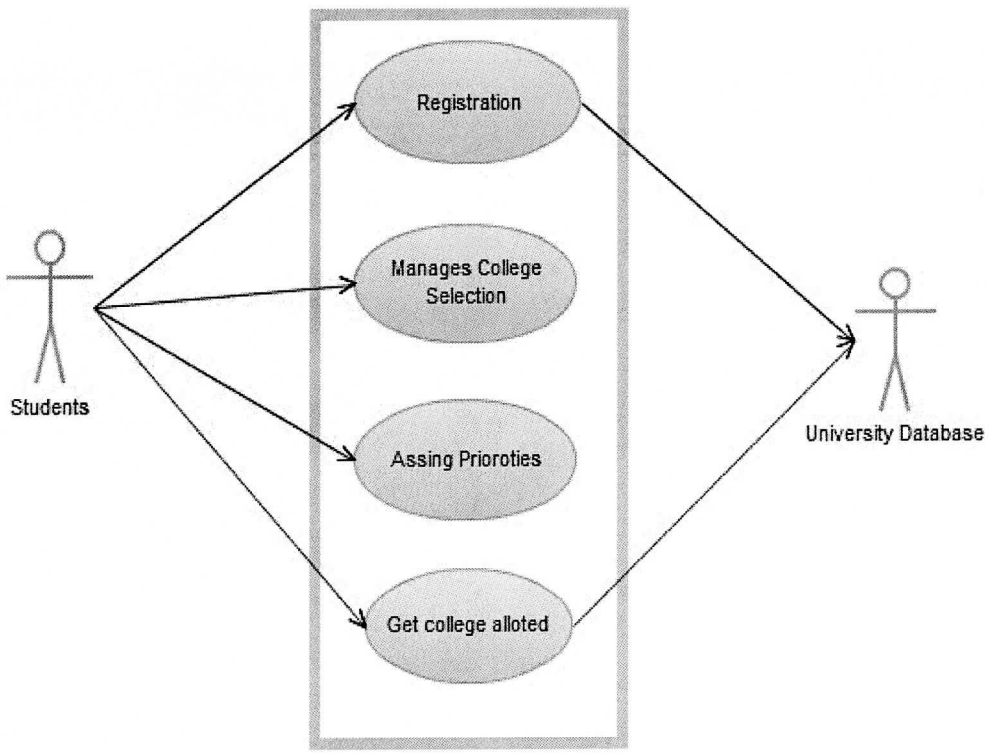

Figure 18 : Use case diagram for entire virtual web counselling system.

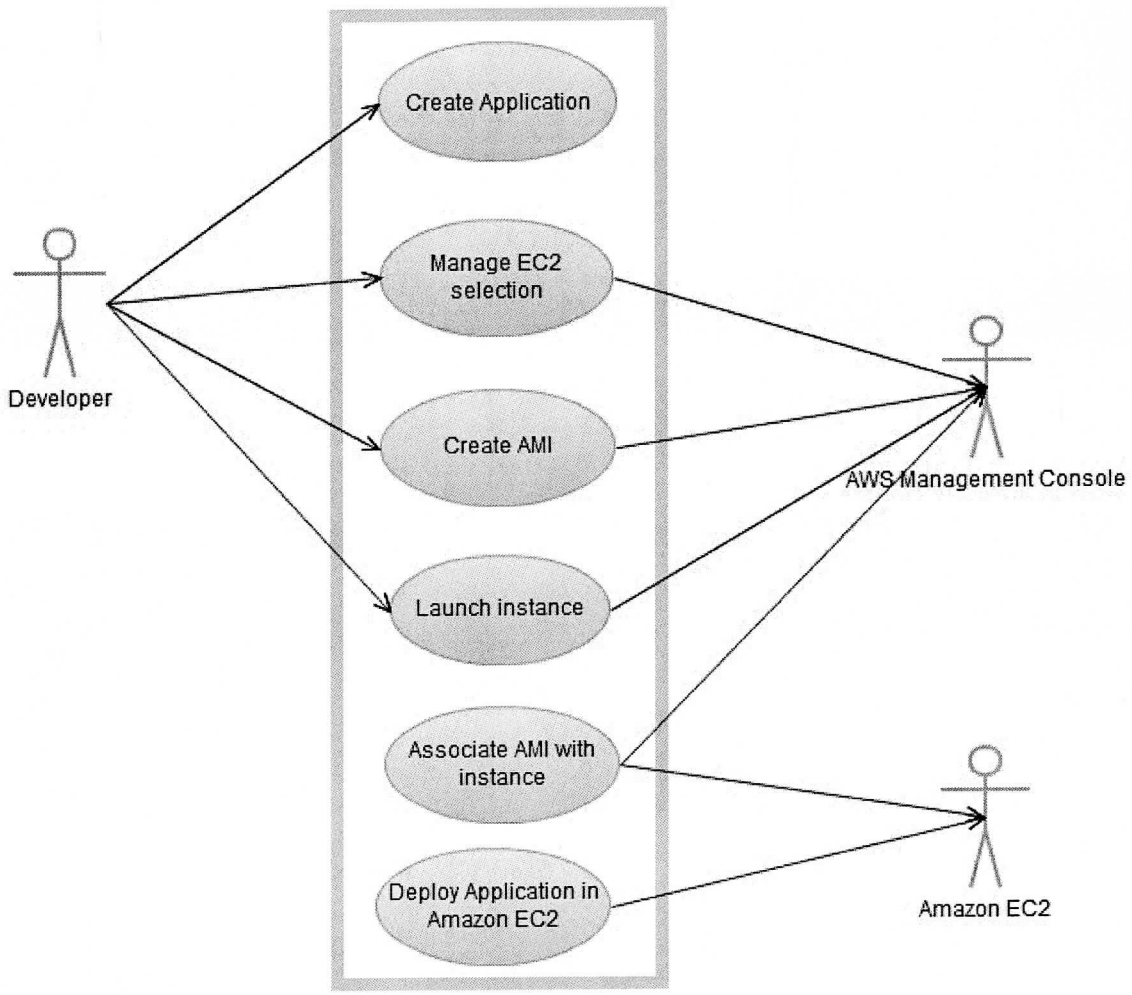

Figure 19 : Use case for student's web counselling application.

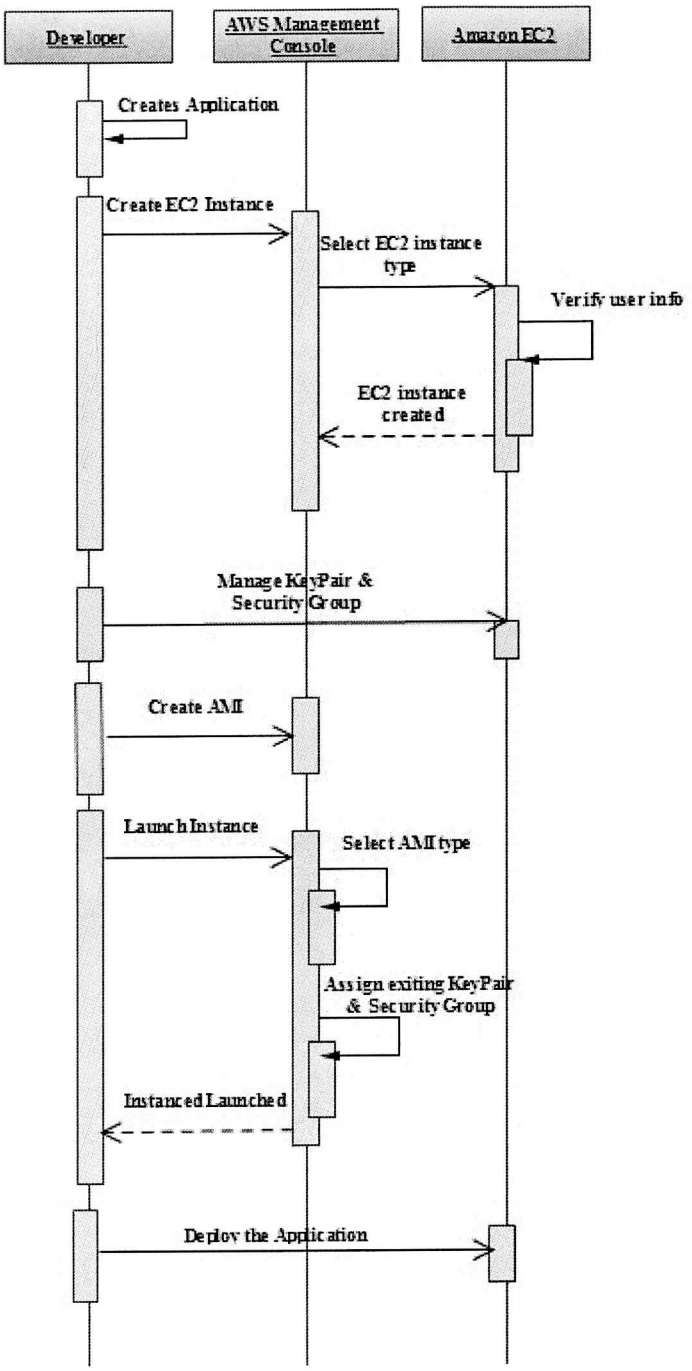

Figure 20 : Sequence diagram to depict project work flow

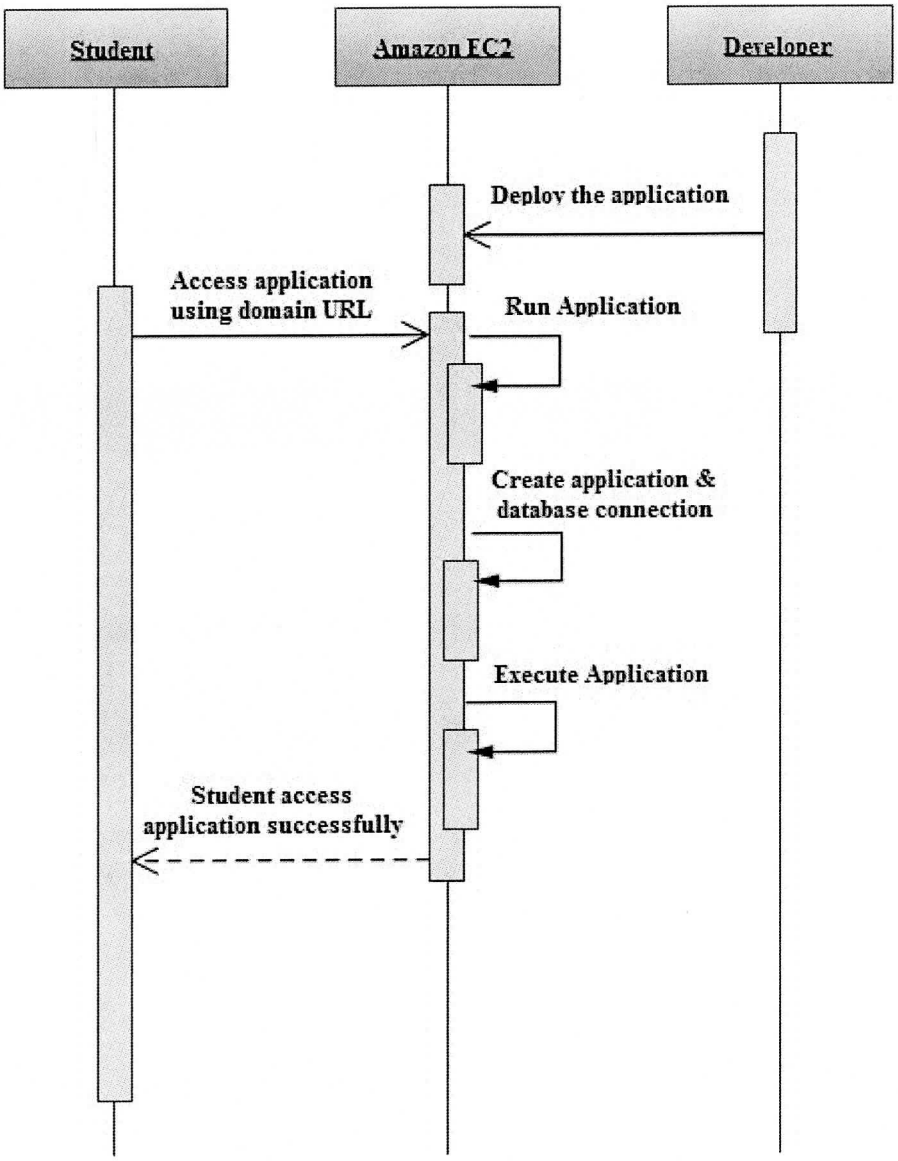

Figure 21 : Sequence diagram showing student accessing the virtual application.

CHAPTER 4

SYSTEM IMPLEMENTATION

System implementation deals with the process of programming the system, testing the system developed and installing in into the server. Based on the modules of virtual web counselling application, we have designed an application which servers as web counselling application for students. Also we have successfully created amazon EC2 instance and launched instance to deployed application into it.

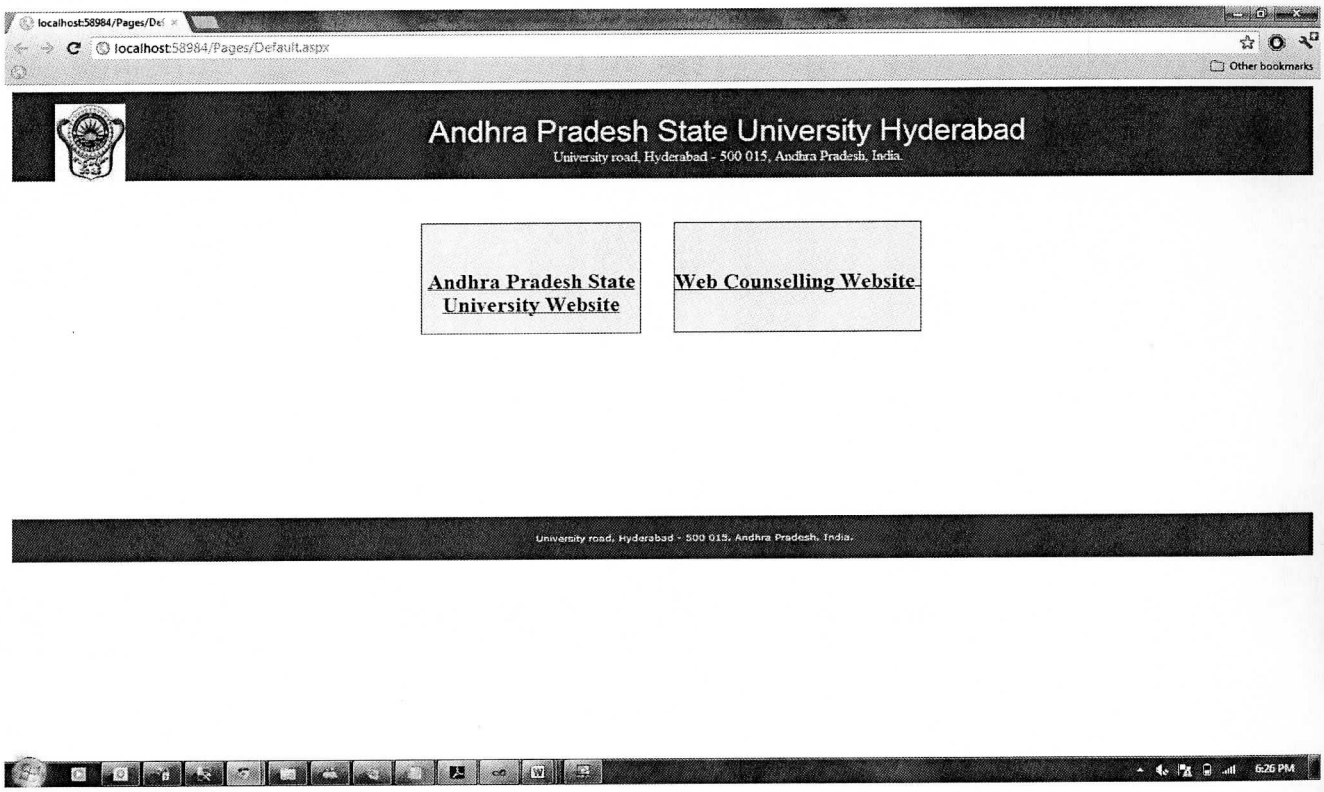

Figure 22 : Web counselling application home page.

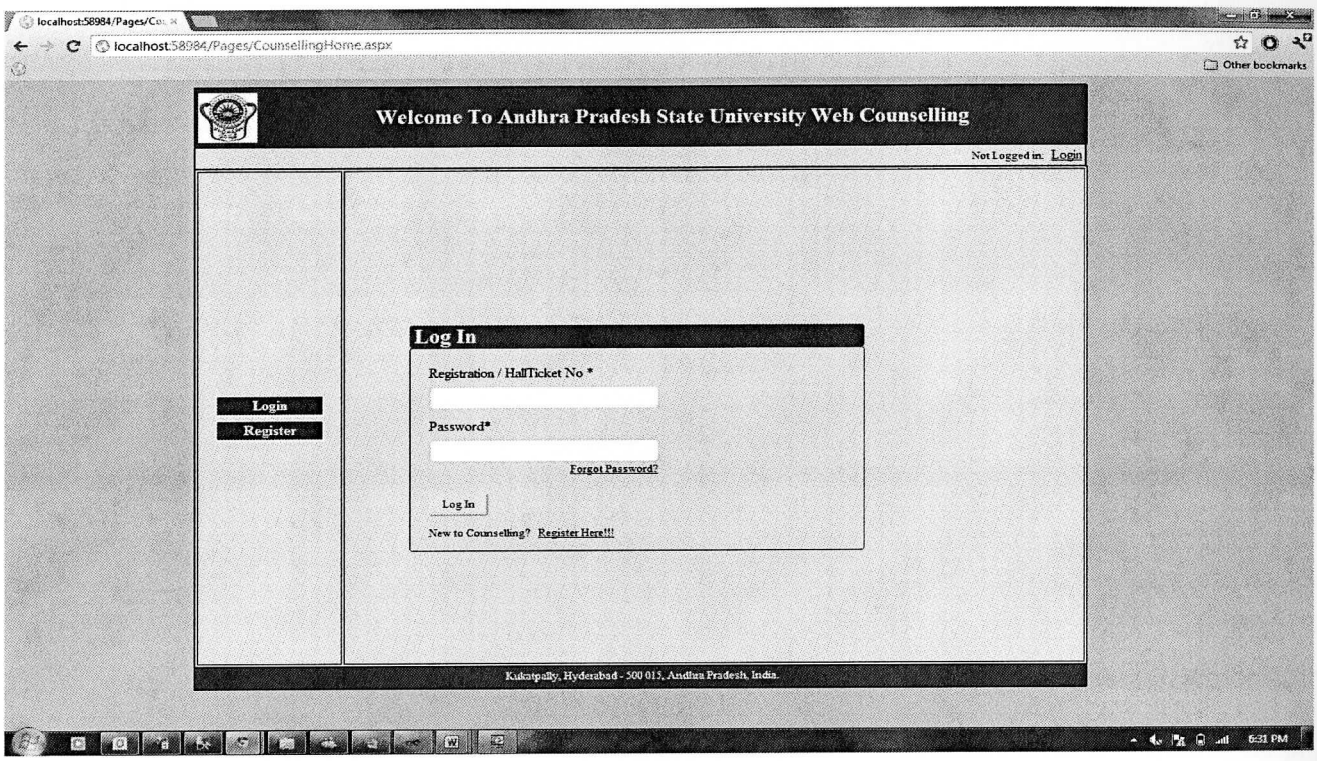

Figure 23 : Login Page

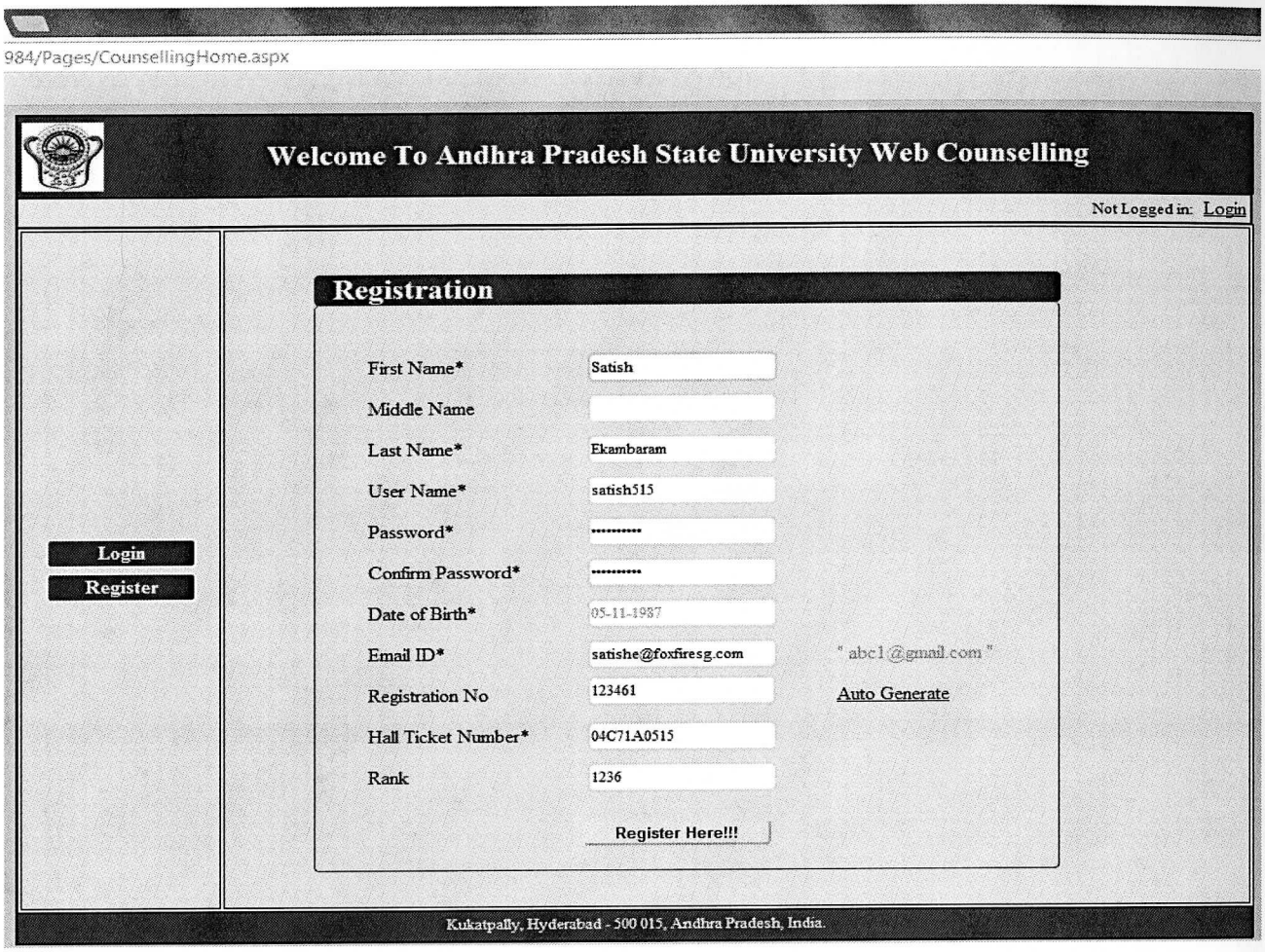

Figure 24 : Registration page with student data.

The data enterd by the student is validated according to the registration rules, then the student will be successfully registered into the web counselling system. If the registration is successfully completed a registration confirmation email with student information like registration number, password, user name etc will be sent to the email specified at the time of registration. Here the registration number will be a default unique number set to the student based on the sequence number in its database.

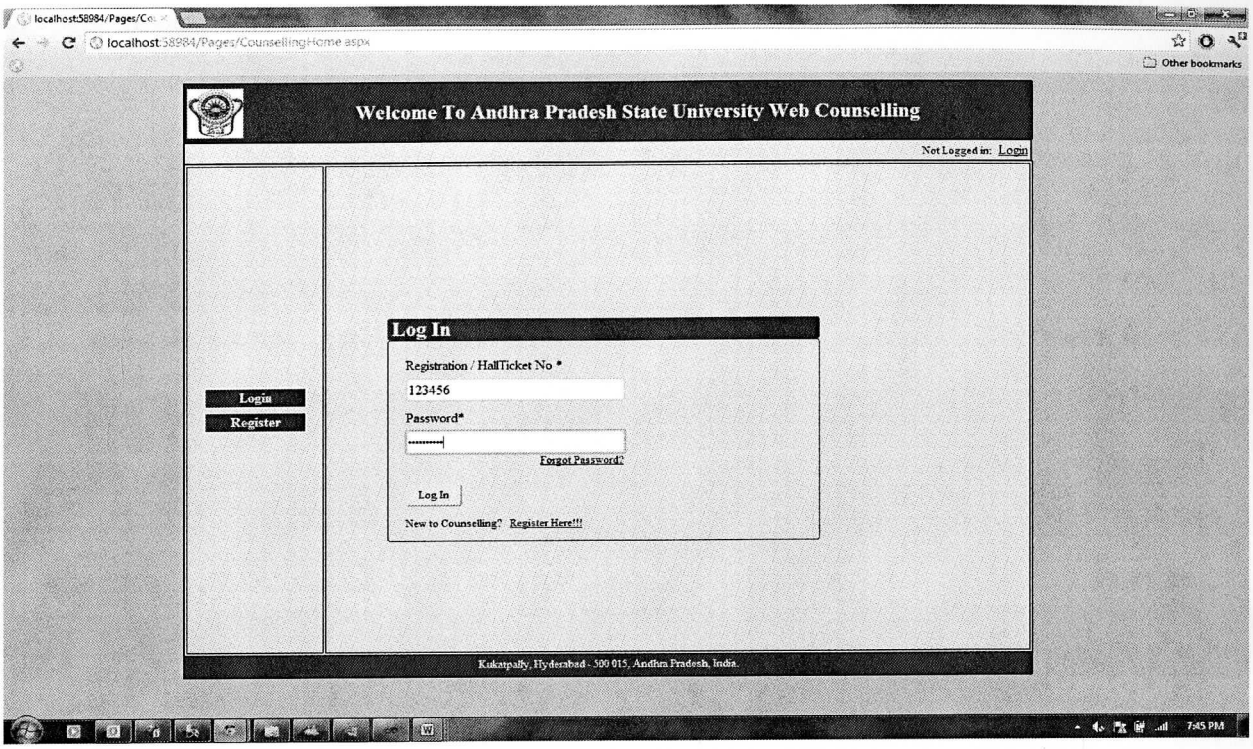

Figure 25: Login page with user credentials.

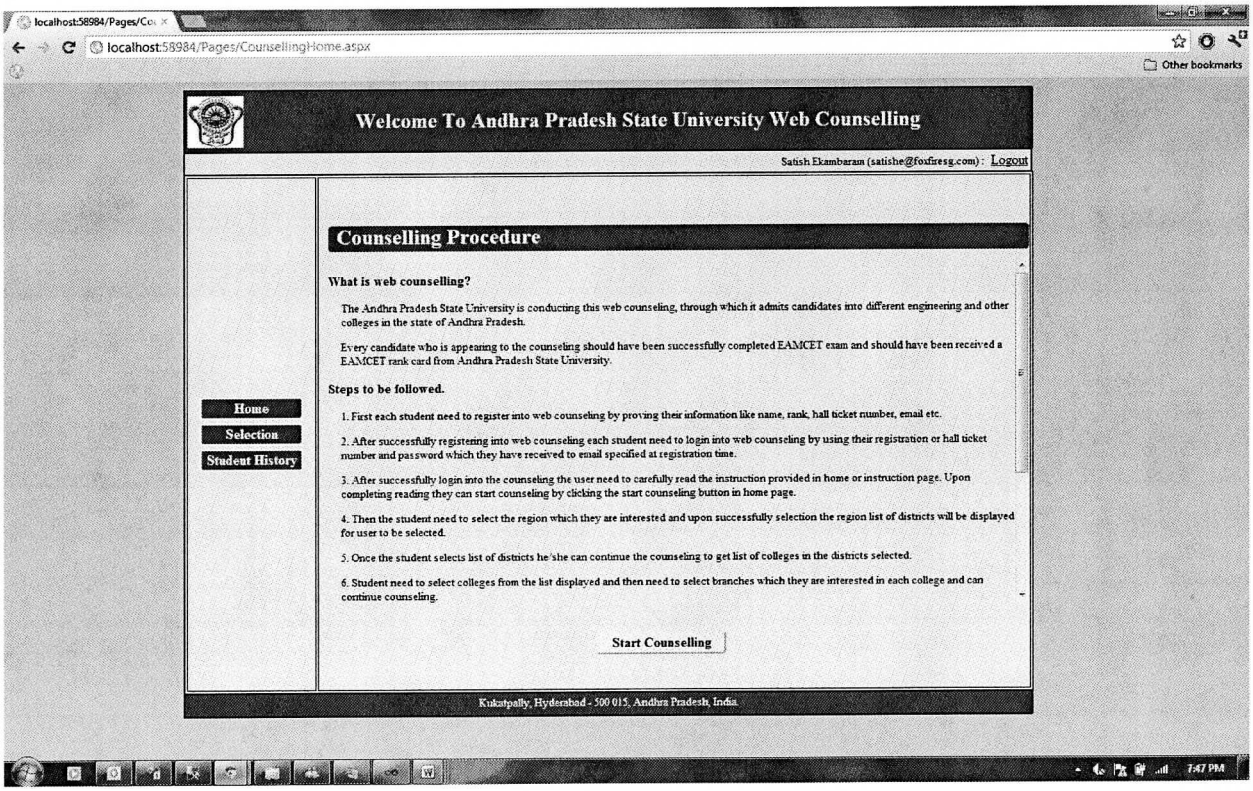

Figure 26 : Home page with counselling procedure and other details.

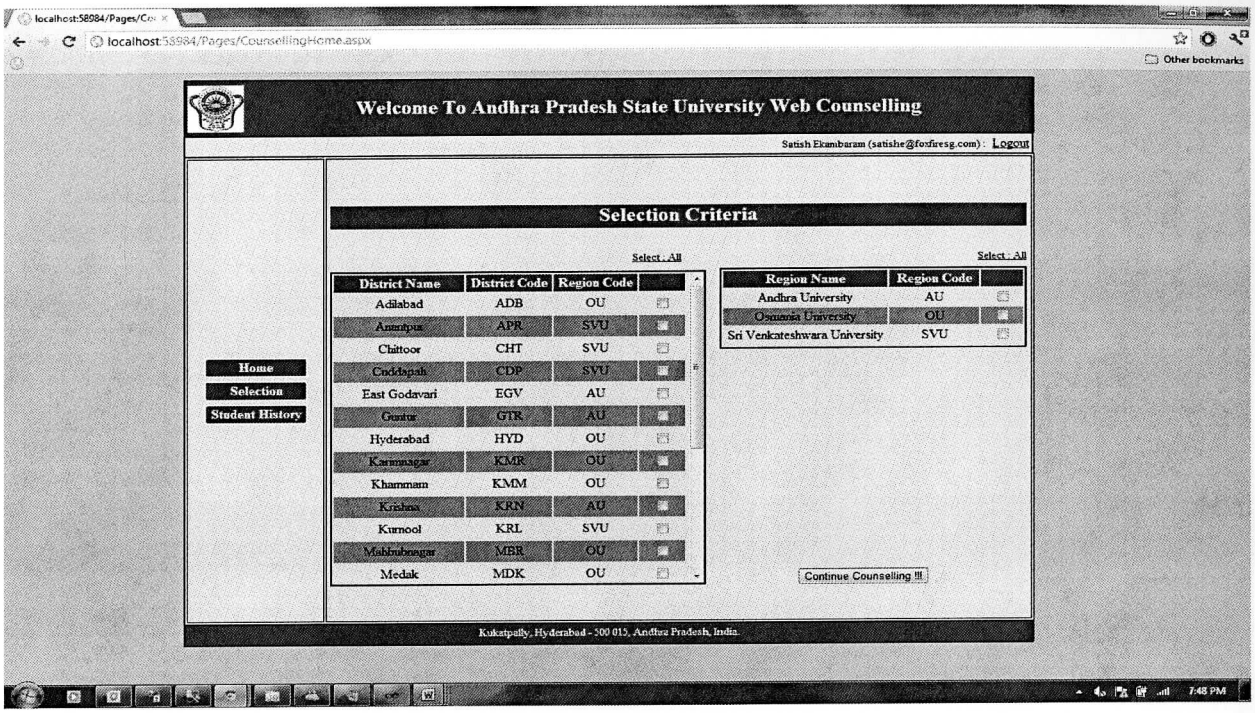

Figure 27 : Selection Page.

After successful login, students will be navigated to the web counselling procedure details page where the student need to go through the counselling procedure details and other important details specified in that page for at least once or more times. After reading through the counselling procedure information they can start the counselling by clicking start counselling button on home page. The entire counselling process will be based on the ranking system (i.e.) student with lesser rank will first attend the counselling to have an advantage of selecting a better college for student who are not eligible for counselling on that days counselling schedule the application will disable start counselling option which does not allow the student to attend the counselling procedure. Later, if the student is eligible for on that counselling schedule day, the student will be navigated to the selection page where they can select one or more regions and districts which they are interested at. After each selection of a region the districts lists will be repopulated in the districts panel.

Select all link buttons are specified to select or unselect every item in that particular panel. Student need to select one or more districts to continue counselling, and once selected student can click on continue counselling button to navigate to college's page which displays colleges located in the districts selected.

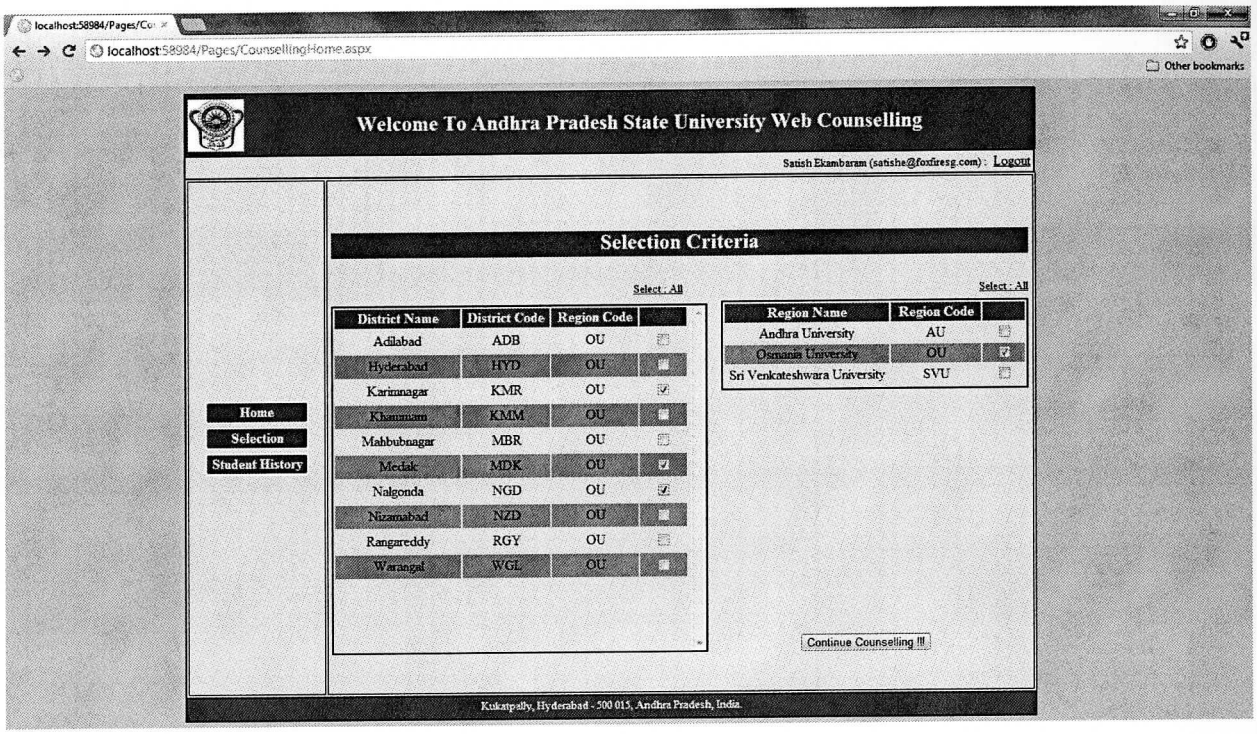

Figure 28 : Selection page with regions and its districts selected.

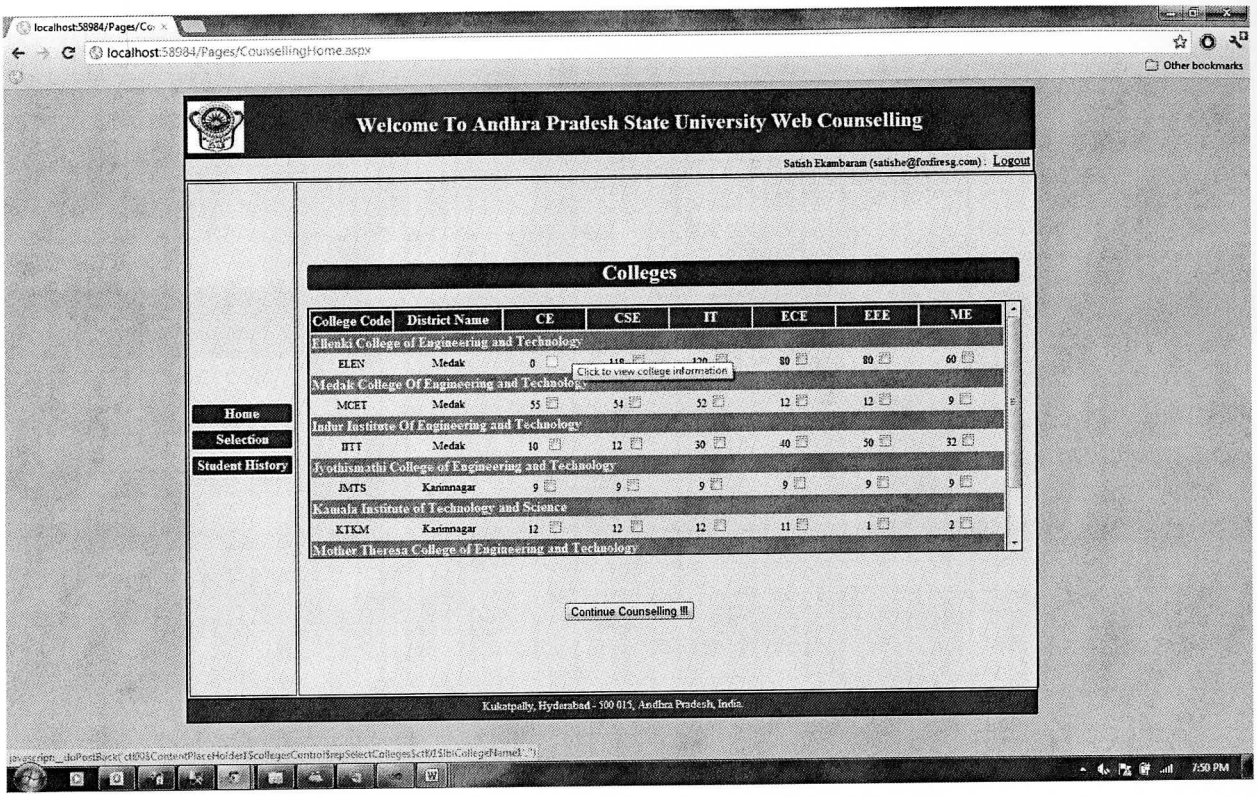

Figure 29 : College Page with list of colleges located in districts selected.

In Figure 29 : College Page with list of colleges located in districts selected.Figure 29 the list of colleges located in the districts selected are listed. In additional to the colleges list, each college also displays the college code, district in which it is located (for reference if selected multiple districts) and current number of seats available in each branch. If the number of seats available is zero then the select check box will be disabled, allowing the user not to check or select the branch. Also each college name displayed in the list is a link to colleges information page which displays complete details about the college selected.

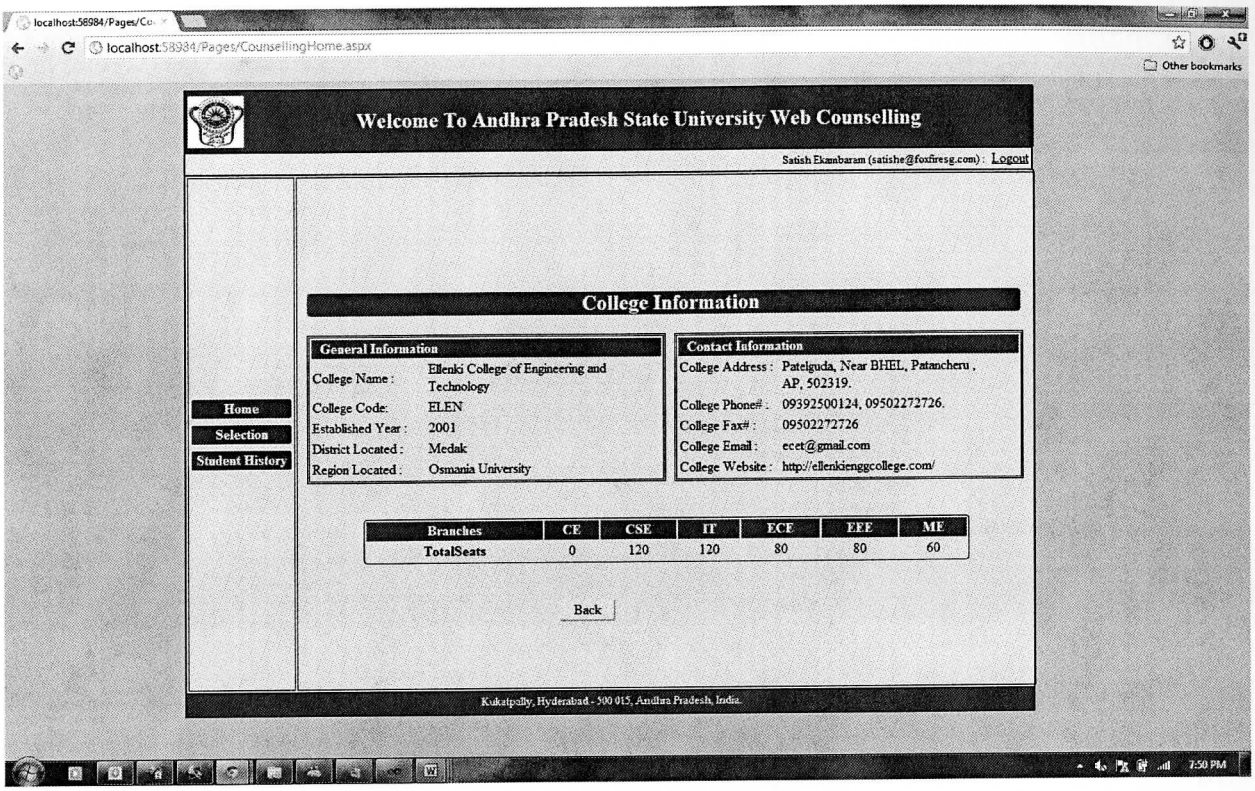

Figure 30 : College information page.

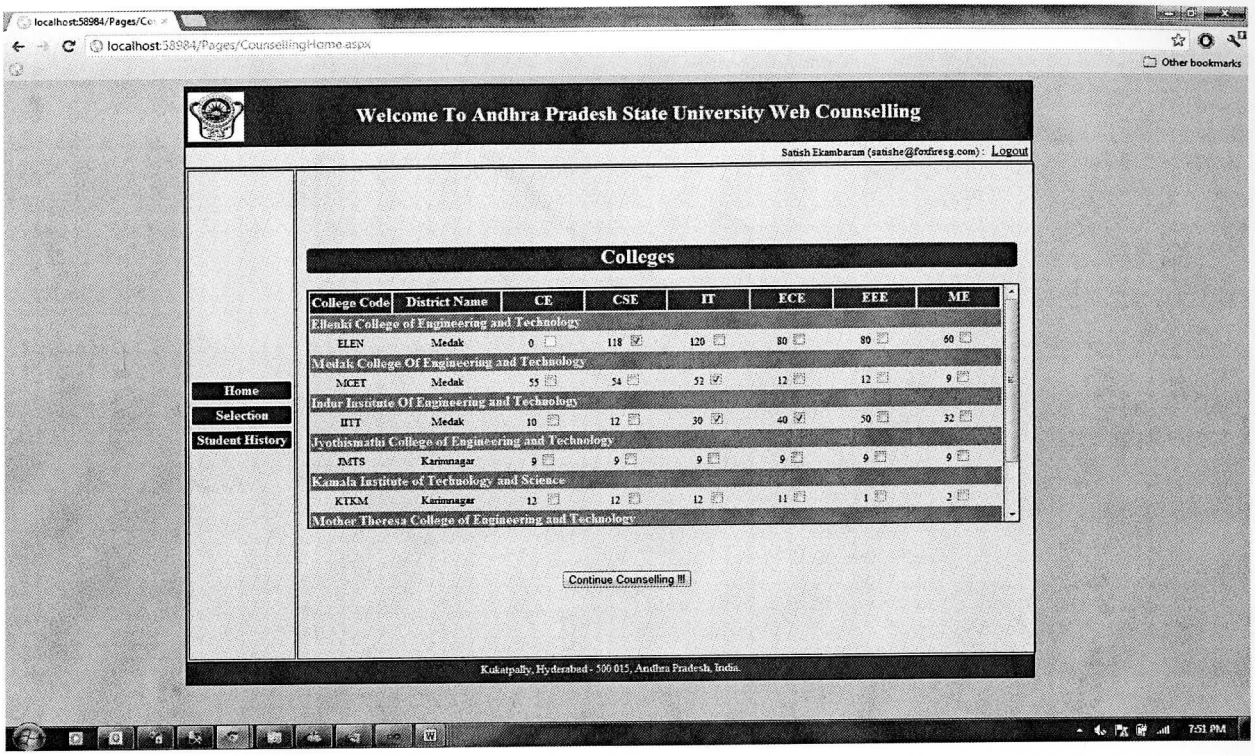

Figure 31 : List of colleges selected for allotment.

Students need to select at least one or more colleges to continue counselling for allotment. It is also possible for a student to select multiple branches in same college which will further be displayed in the allotment list to select priorities. Once the user selects the colleges and clicks the continue counselling button it will navigate to college confirmation page where user can either confirm the colleges selected or can even navigate back to colleges page by selection change college option in selected colleges page.

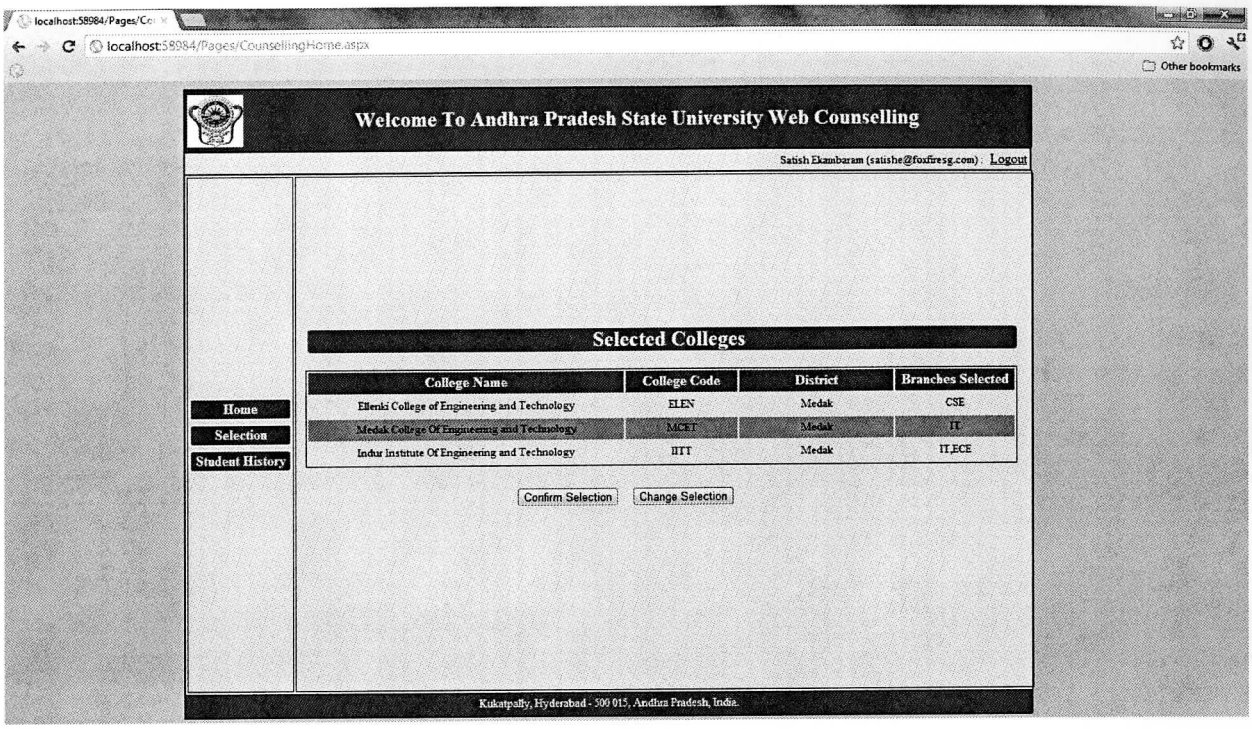

Figure 32 : Selected colleges page with list of colleges selected.

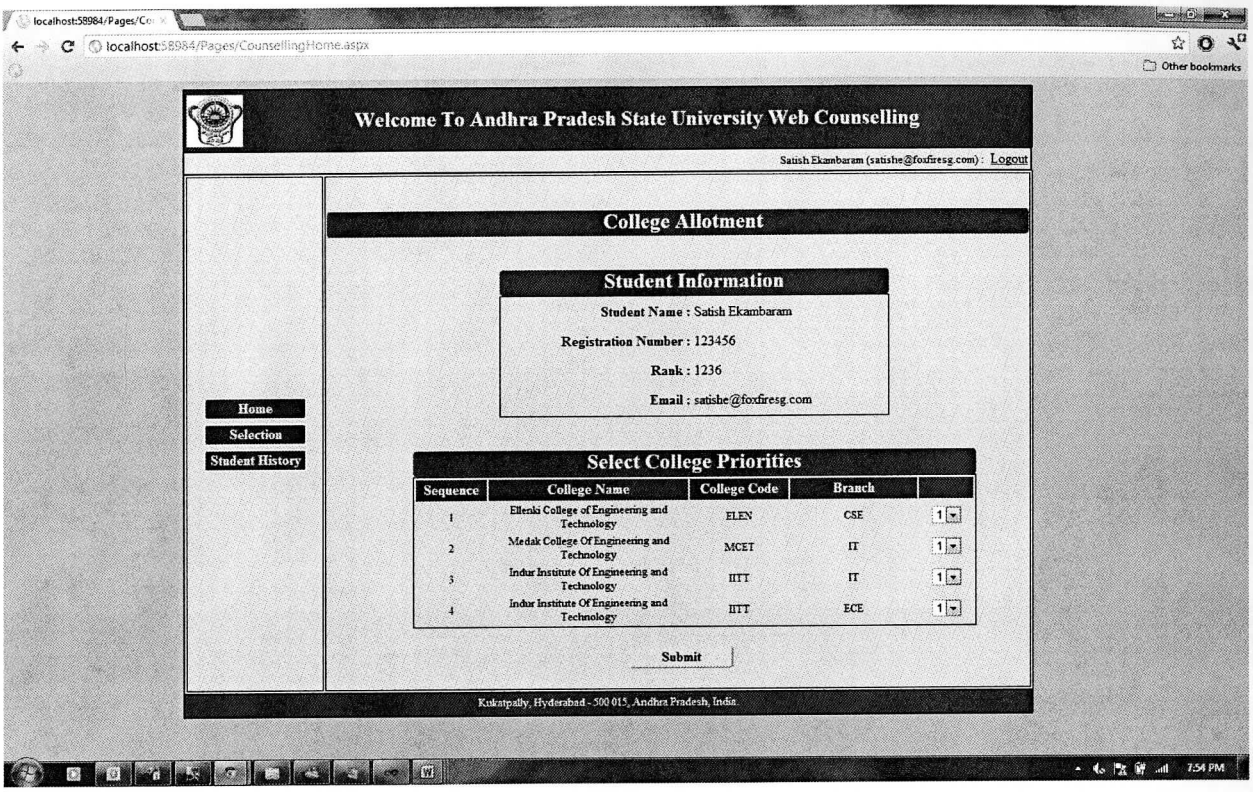

Figure 33 : Allotment page

Once the user selects confirm selection button in colleges page the process will navigate to allotment page where basic information of the student is displayed and also it allows the user to assign the priorities for the colleges and branches selected. Priorites need to set for each college with number starting from 1 to the total number of colleges selected. If the student selects multiple branches for same college a list of same colleges will be repeated in the select college priorities panel but with different branches. As shown in Figure 33 colleges listed in number 3 and 4 are same but with different branches.

Priorities assigned to each colleges need to be unique compared with other collge and if priorities are repeated then an error message will be displayed at the submitting colleges for allotment.

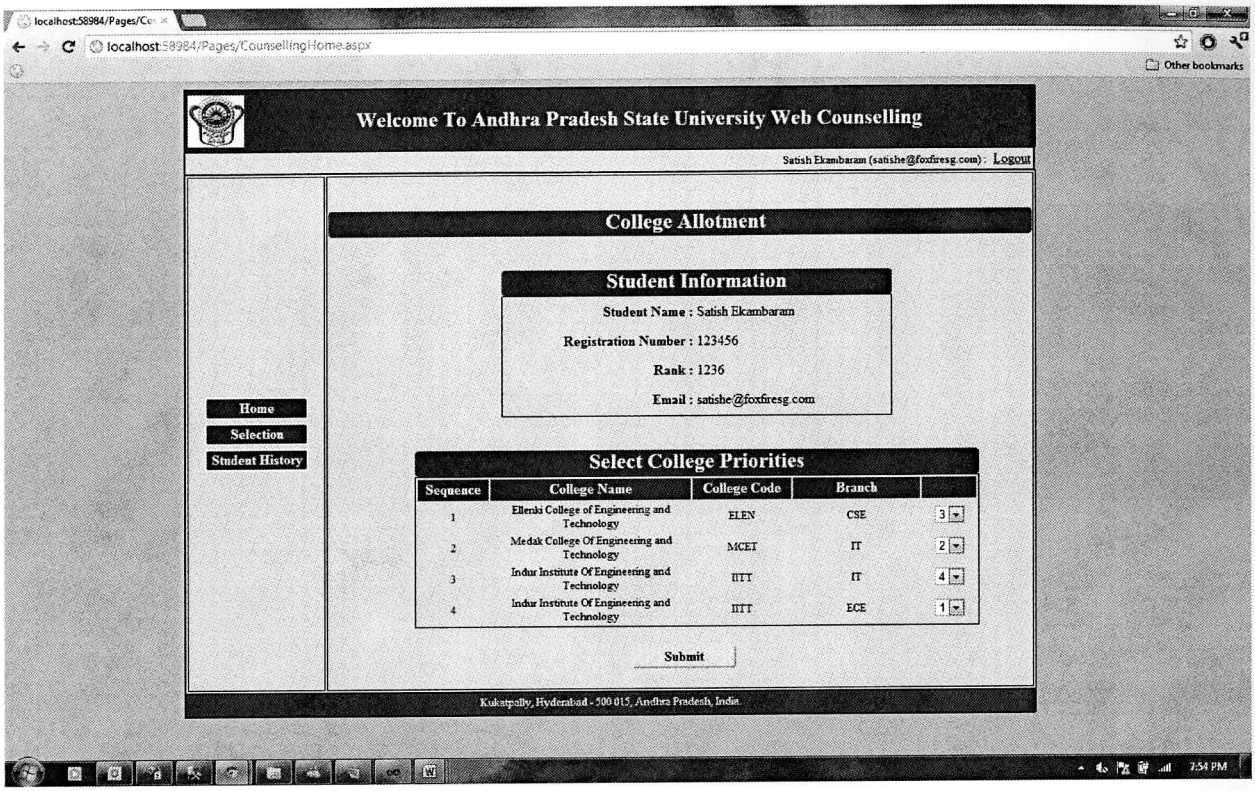

Figure 34 : Unique priorities assigned for list of colleges.

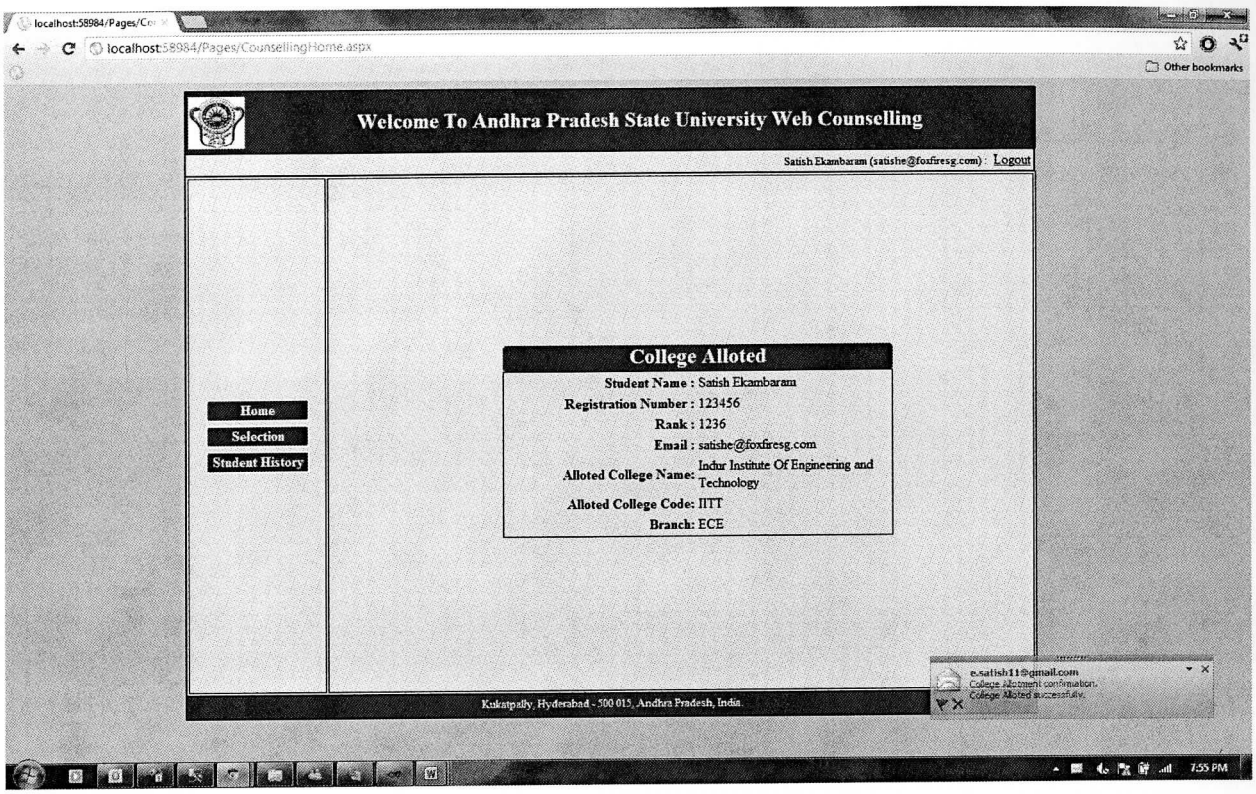

Figure 35 : College allotted page.

Once the priorities are selected and the submit button is clicked the application process the request and allots a college for the student. This allotment process is done based on the priorities and current availability of seats as the application is handled by multiple users at same time the number of available seats cannot be same at the time of selecting colleges and submitting the college's for allotment. So the allotment processes start with first priority college and if the current available seats in that college and branch are zero the process continues with allotment of the second college. If the user is not allotted with any college the page navigates back to the selection page where the student needs to re select the college for allotment. If application processes the allotment and successfully allots a college then the confirmation message is displayed on the screen with student personal and college information. Also an allotment confirmation email is sent to students email account with allotment details. Student can view their allotment history in student history page which is shown in Figure 36.

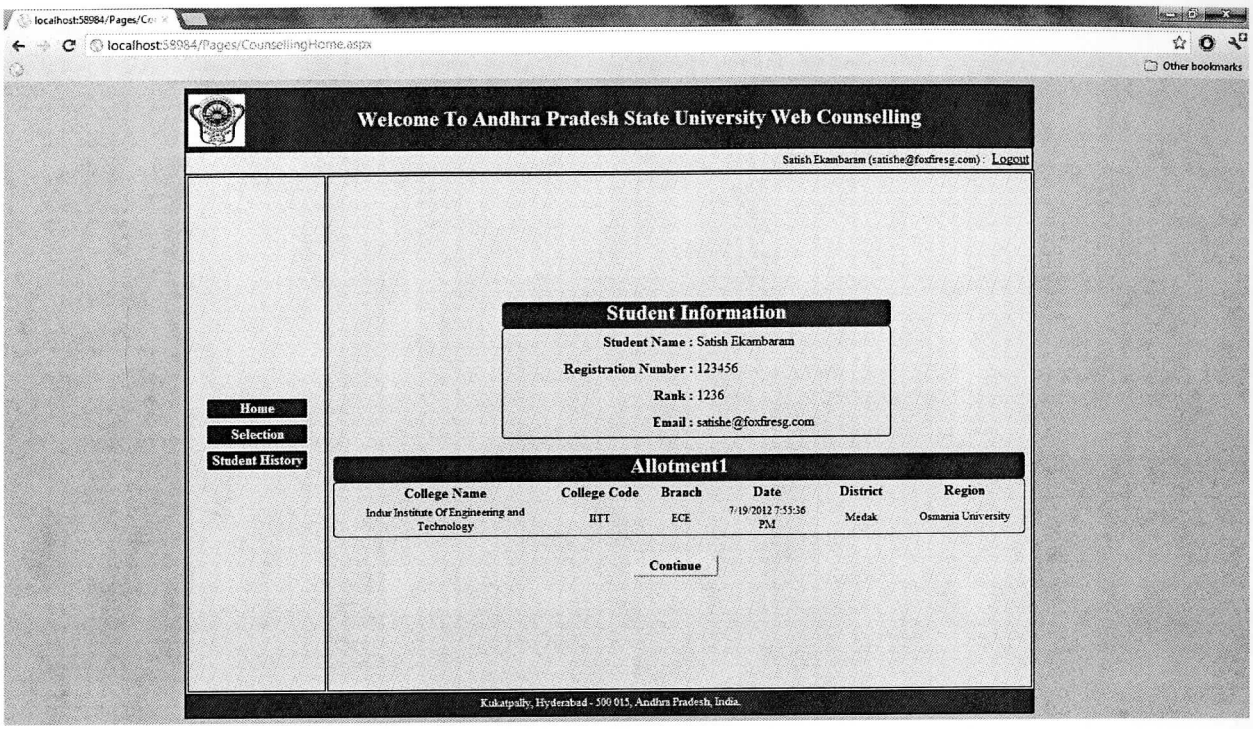

Figure 36 : Student allotment history page.

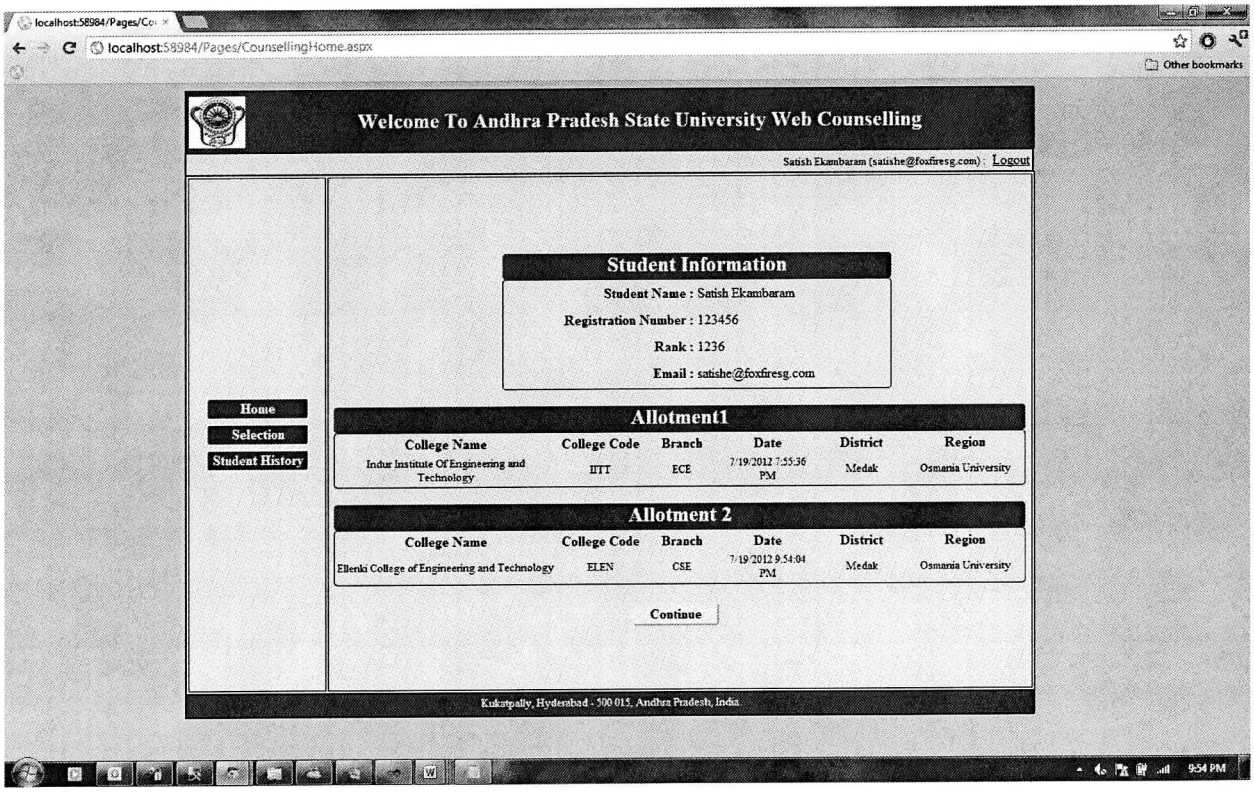

Figure 37 : Student having two allotments.

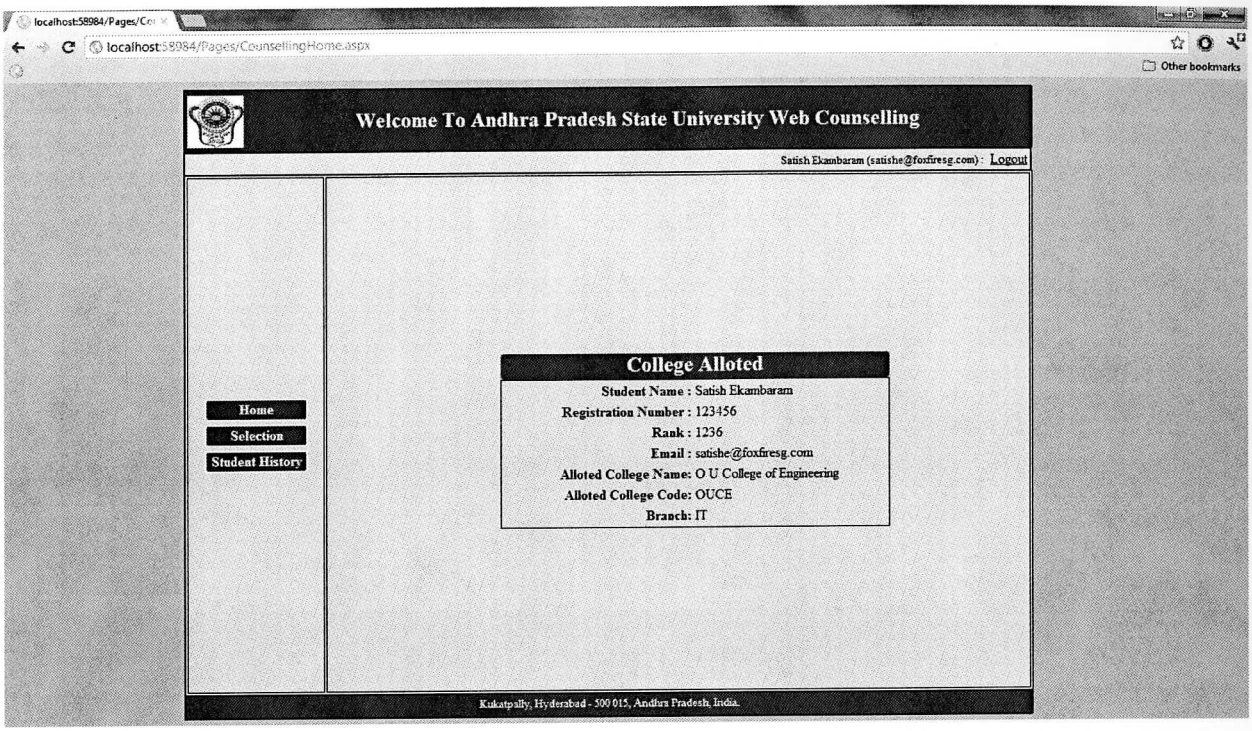

Figure 38 : Allotment confirmation for third college.

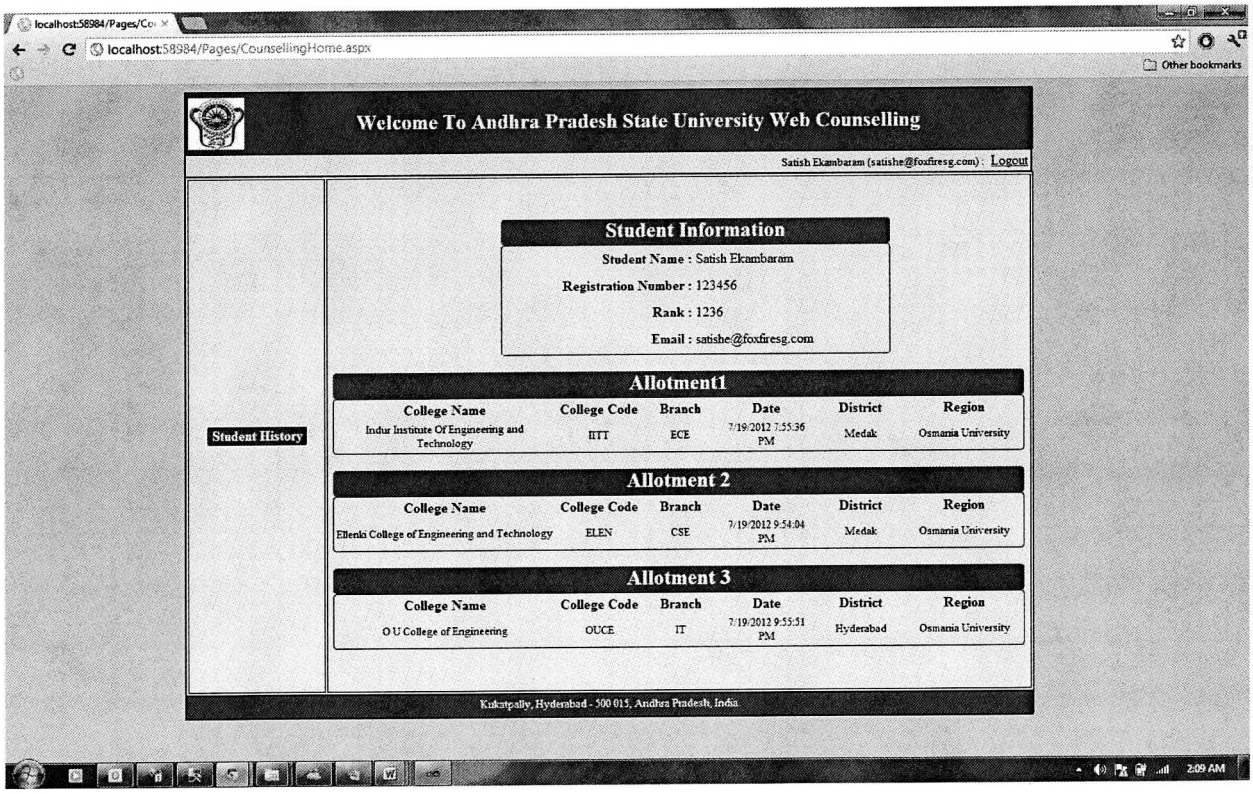

Figure 39 : Student having three allotments.

After three successful allotments the student will no longer be eligible to attend the counselling for future counselling phases. In Figure 39 the student has been successfully allotted with three different colleges and is no longer eligible for counselling. So the application by default disables continue counselling option and other option for the student and will allow the student to access only allotment history page.

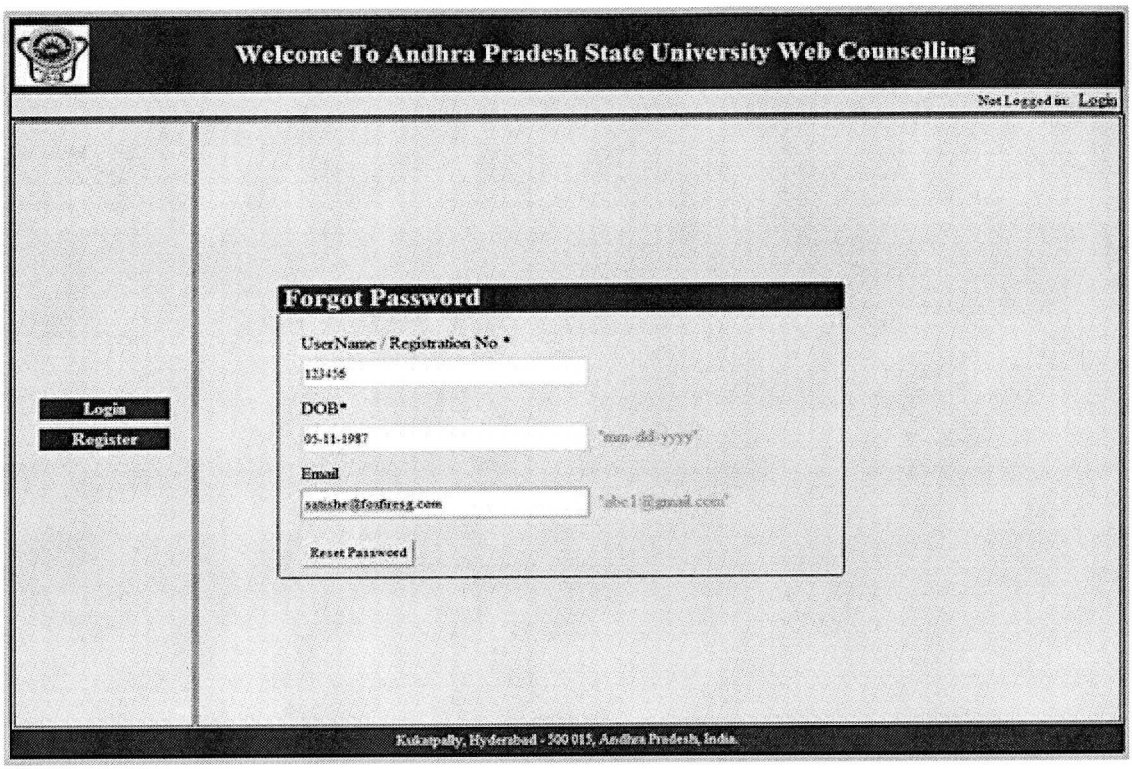

Figure 40 : Forgot password page.

The application provides the flexibility to request for new password whenever they forgot the current password. If the user provides valid information the application will randomly generate a new password for the student, update it to database and will send and password changed email to the users email account with new password in it. Each time the users request for a new password, new password is set and for the first login attempt made by the user after password reset the change password option appears and will prompt the user to select their own password.

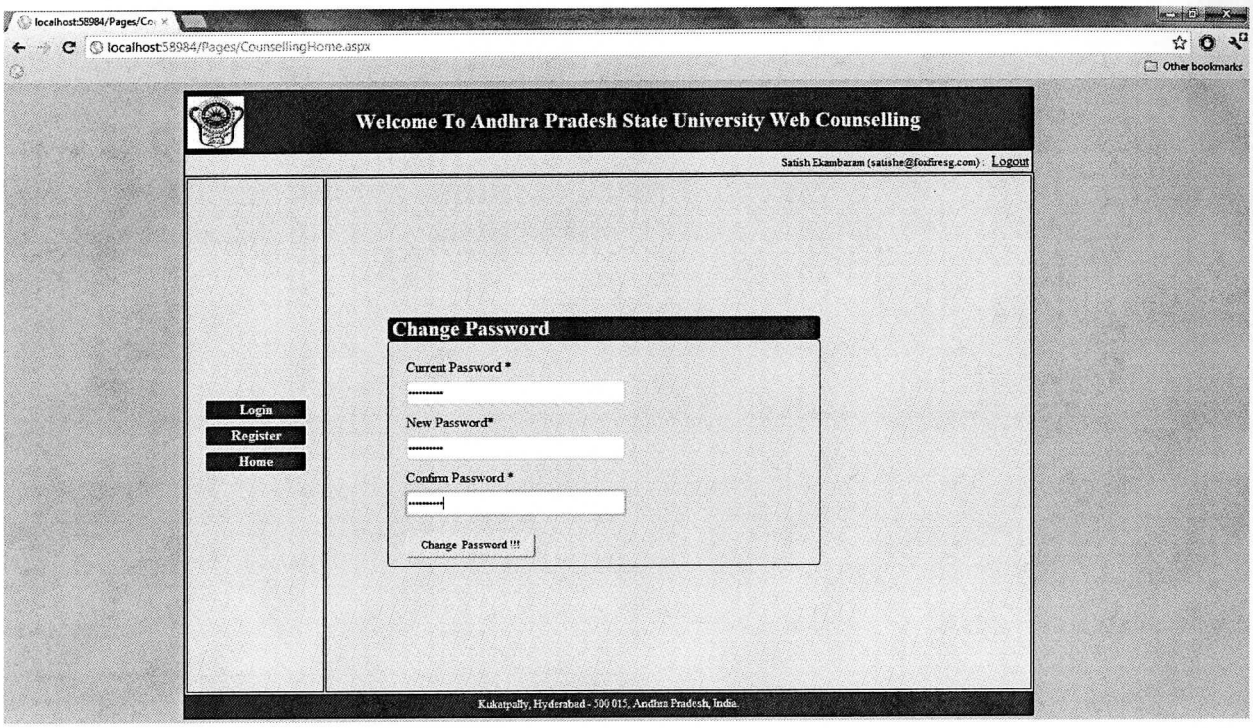

Figure 41 : Change password page.

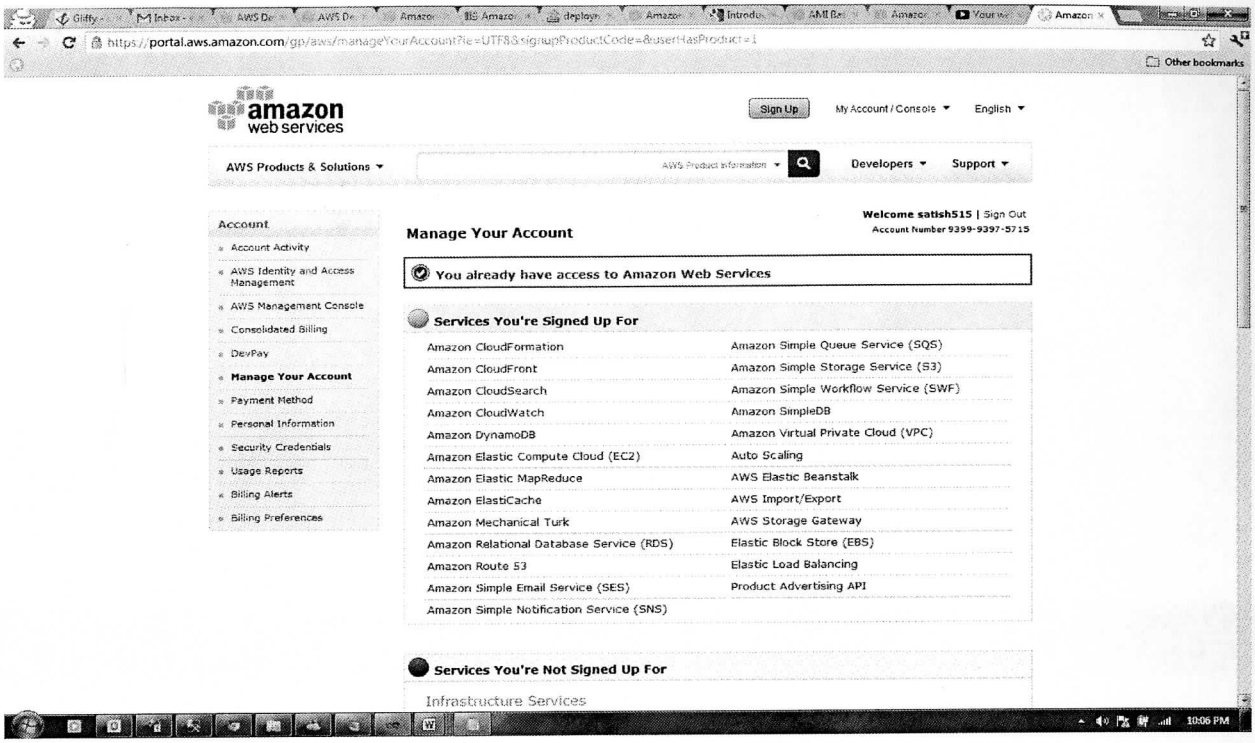

Figure 42 : Amazon services list option screen.

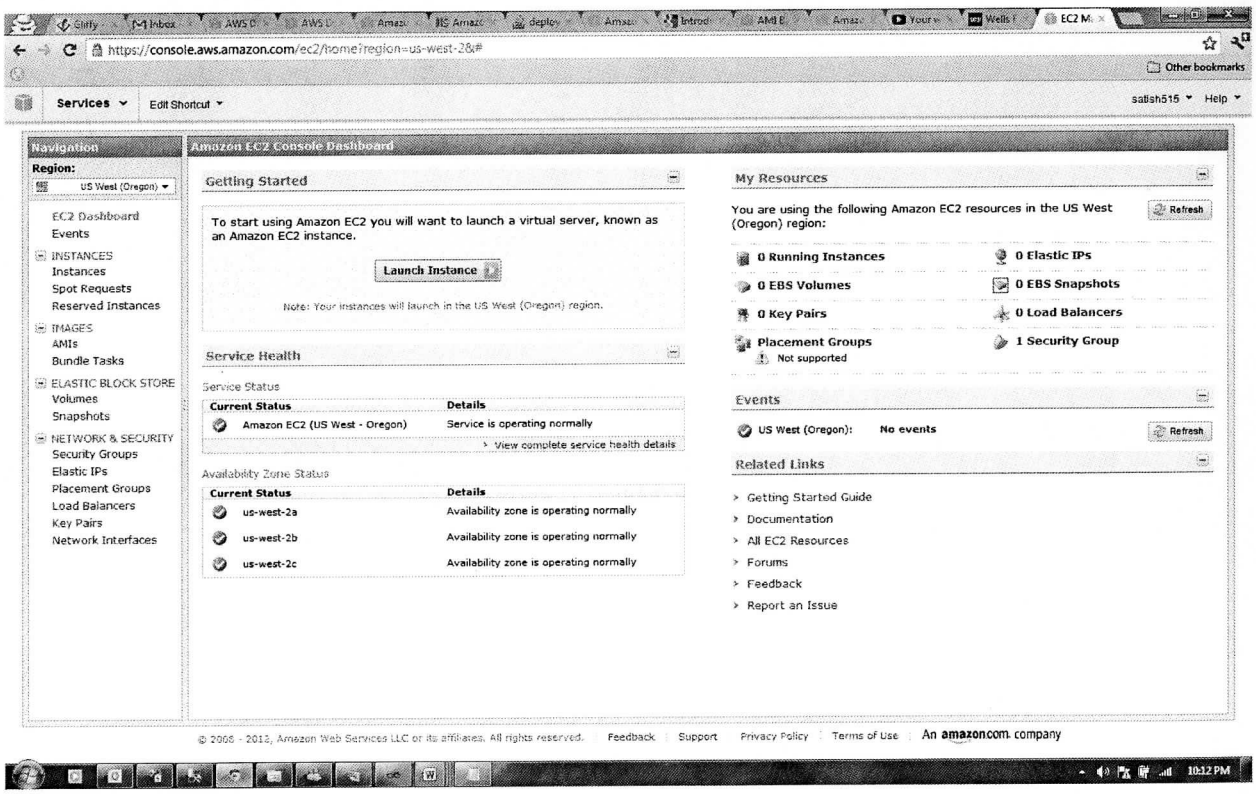

Figure 43 : Amazon EC2 configuration Screen.

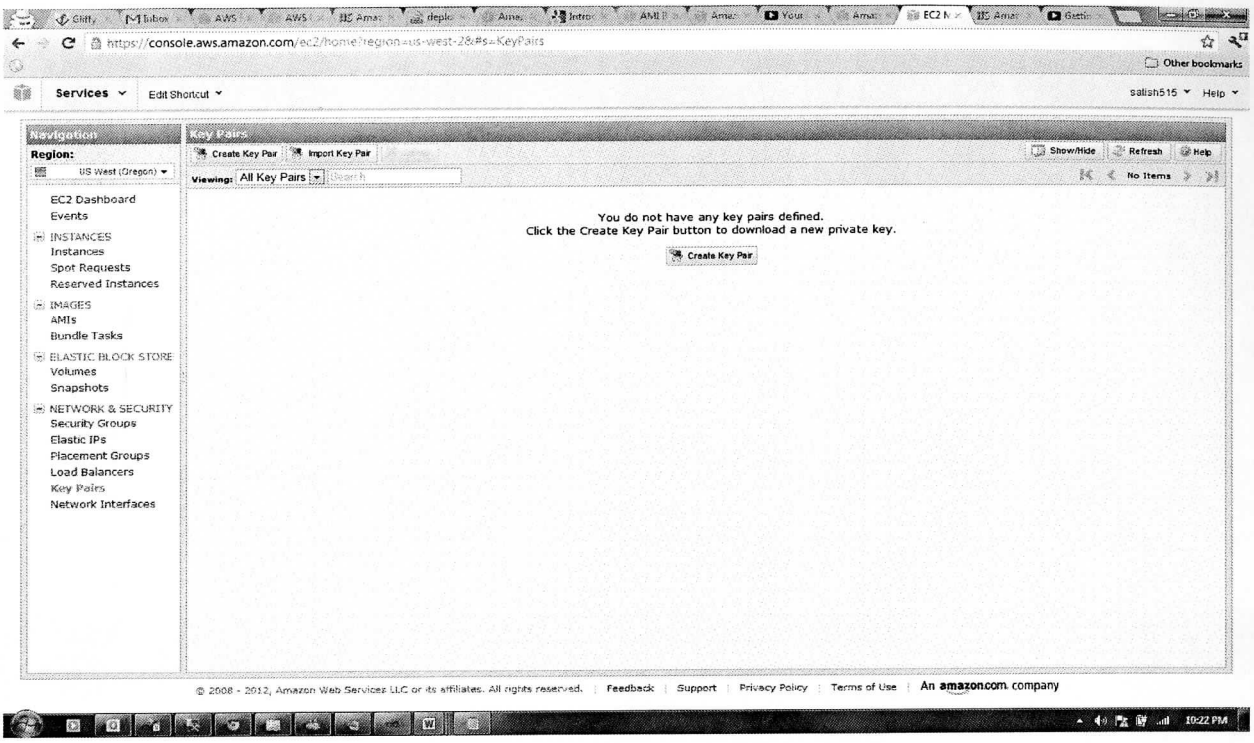

Figure 44 : Create Key Pair Screen.

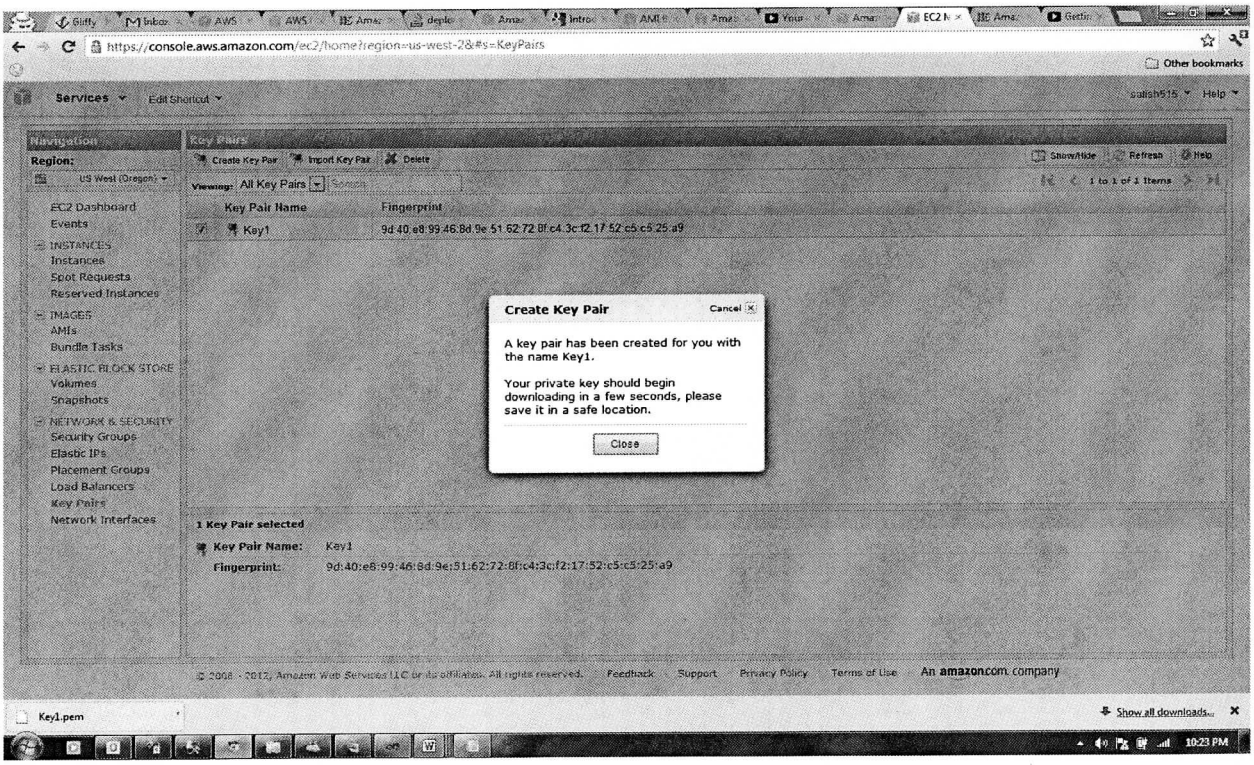

Figure 45 : Key Pair created and is saved for decrypting password.

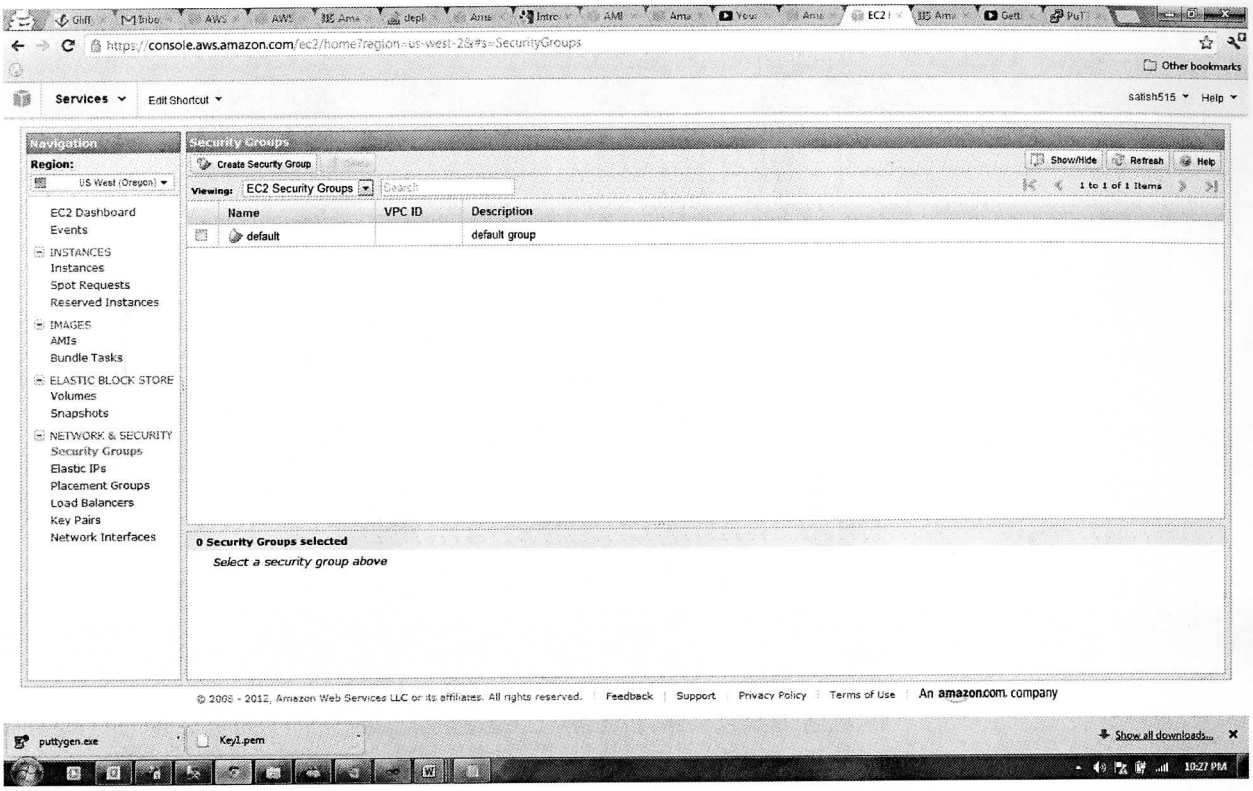

Figure 46 : Configure security group

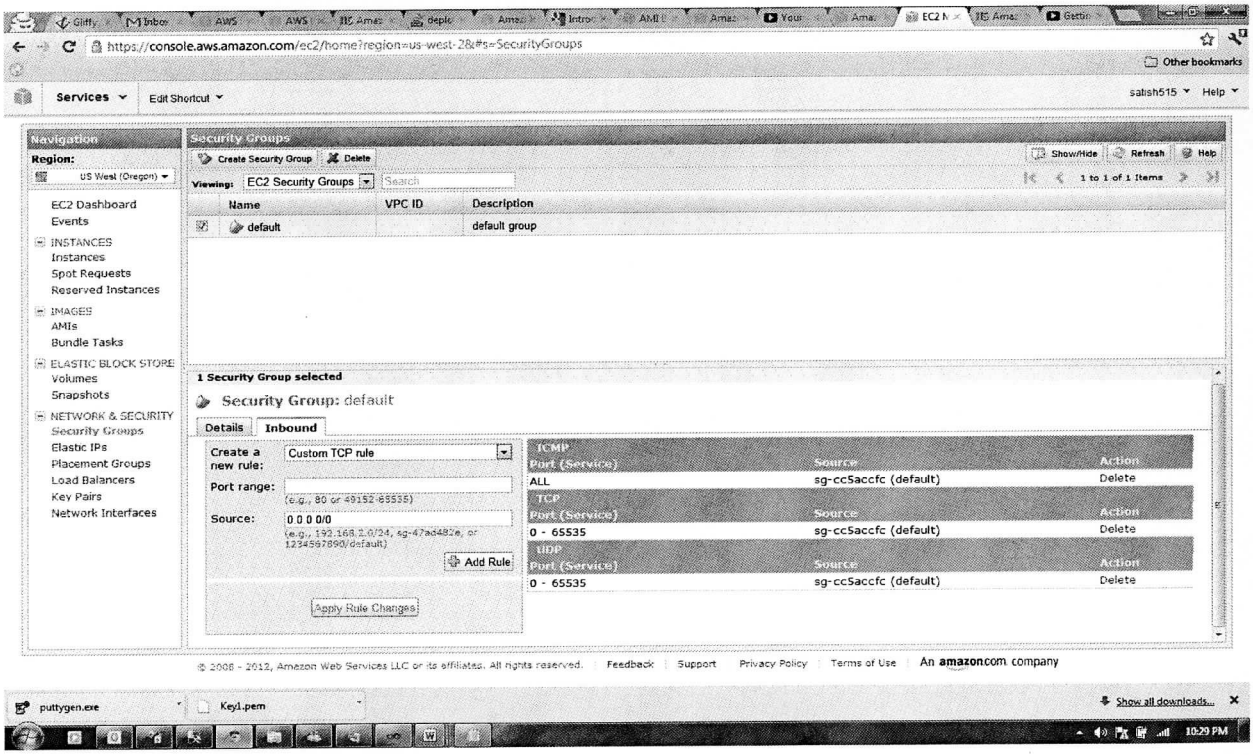

Figure 47 : Adding security rules and firewall rules.

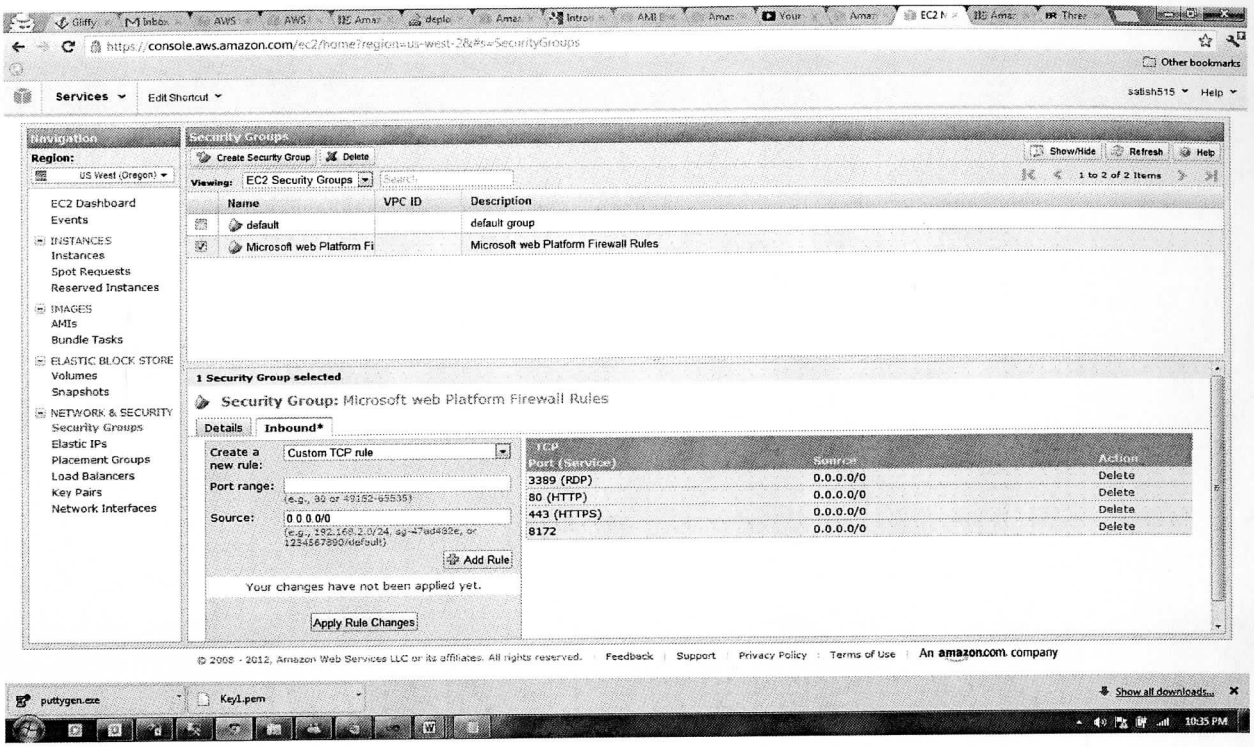

Figure 48 : New security group created and selected to associate with instance.

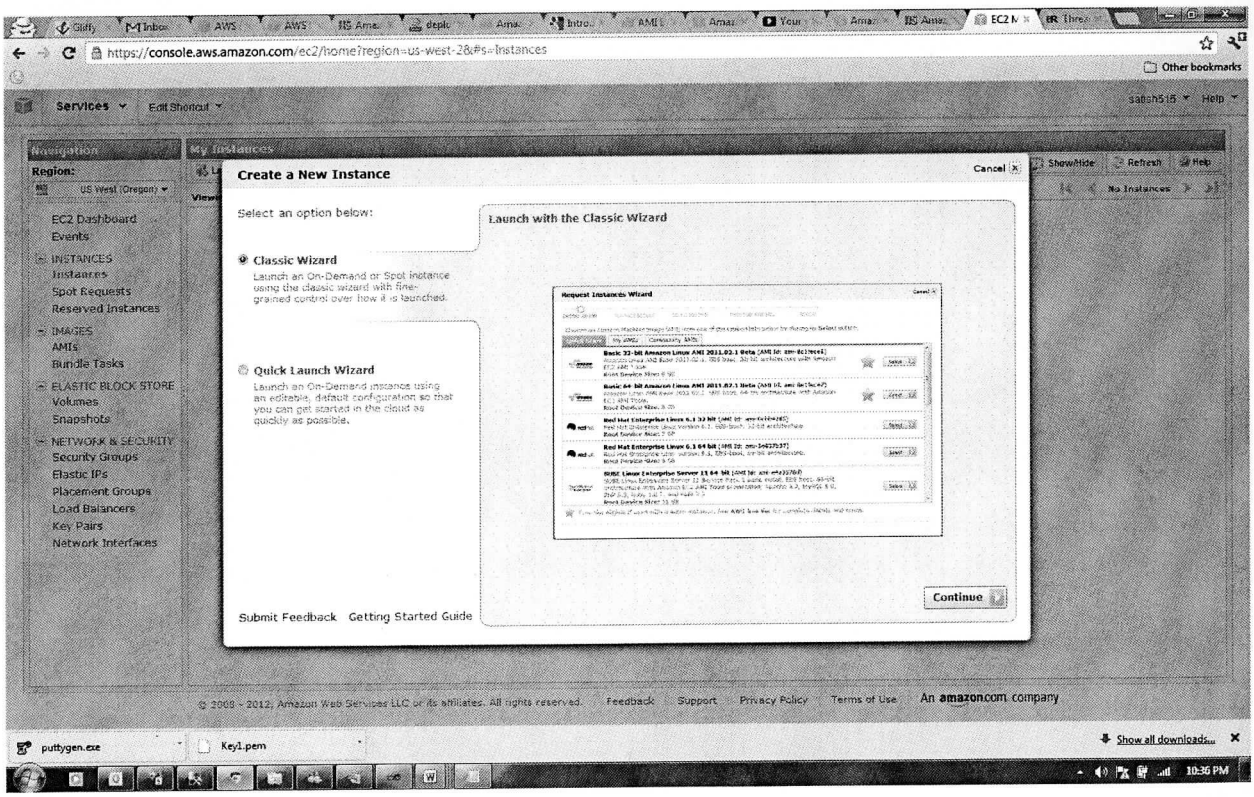

Figure 49 : Create new instance (window instance for web application).

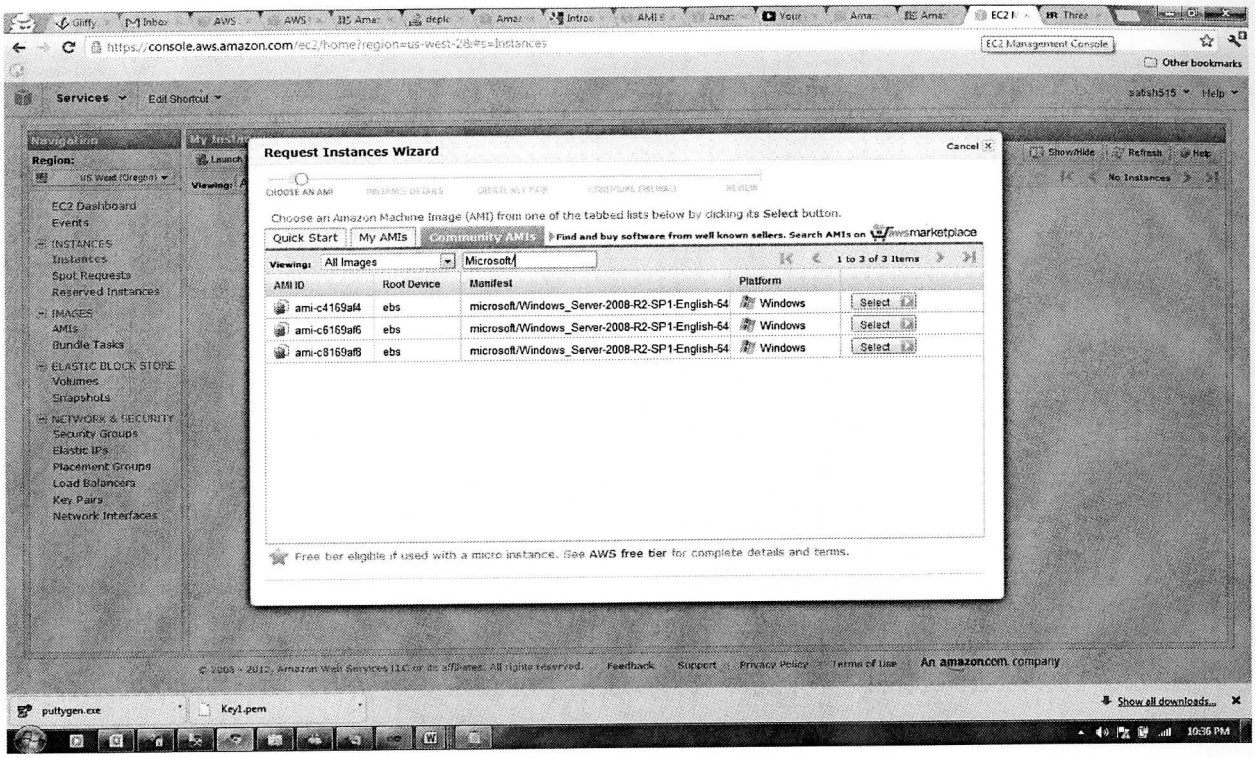

Figure 50 : Select appropriate AMI from the list.

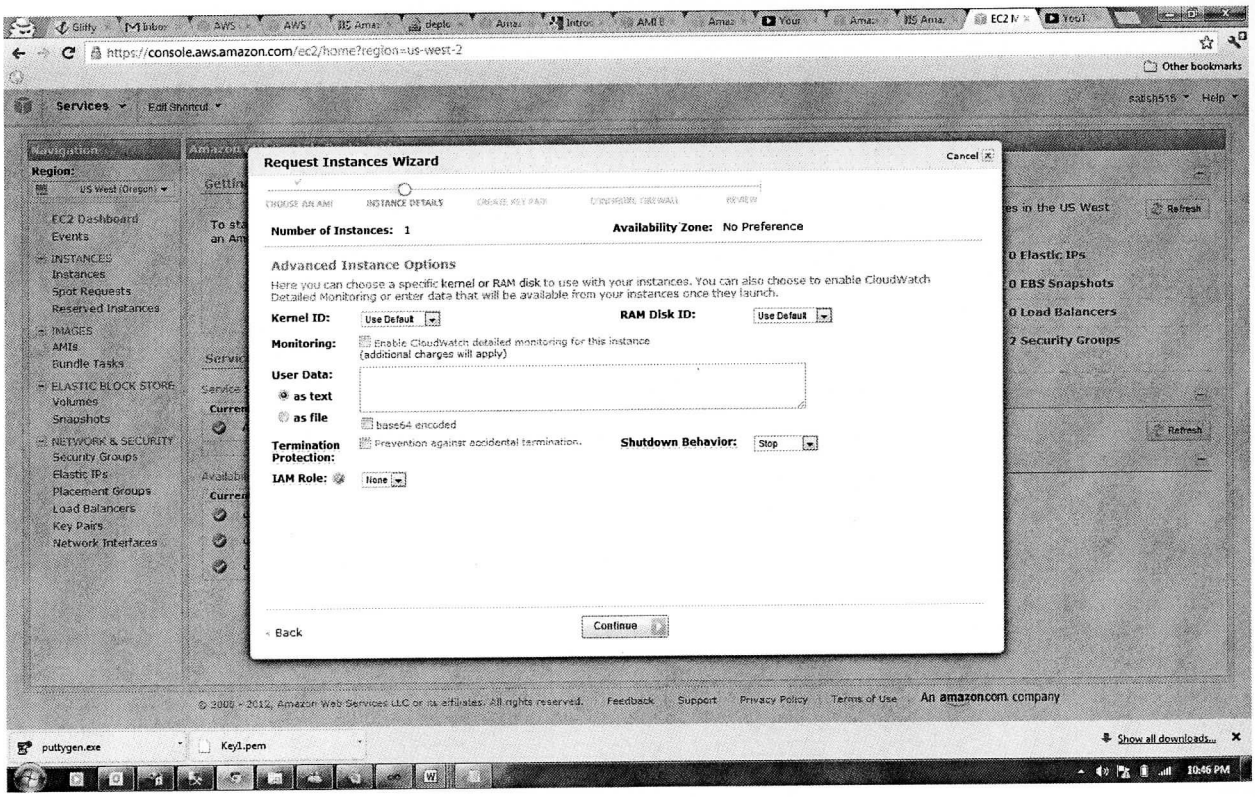

Figure 51 : Instance Launched Successfully.

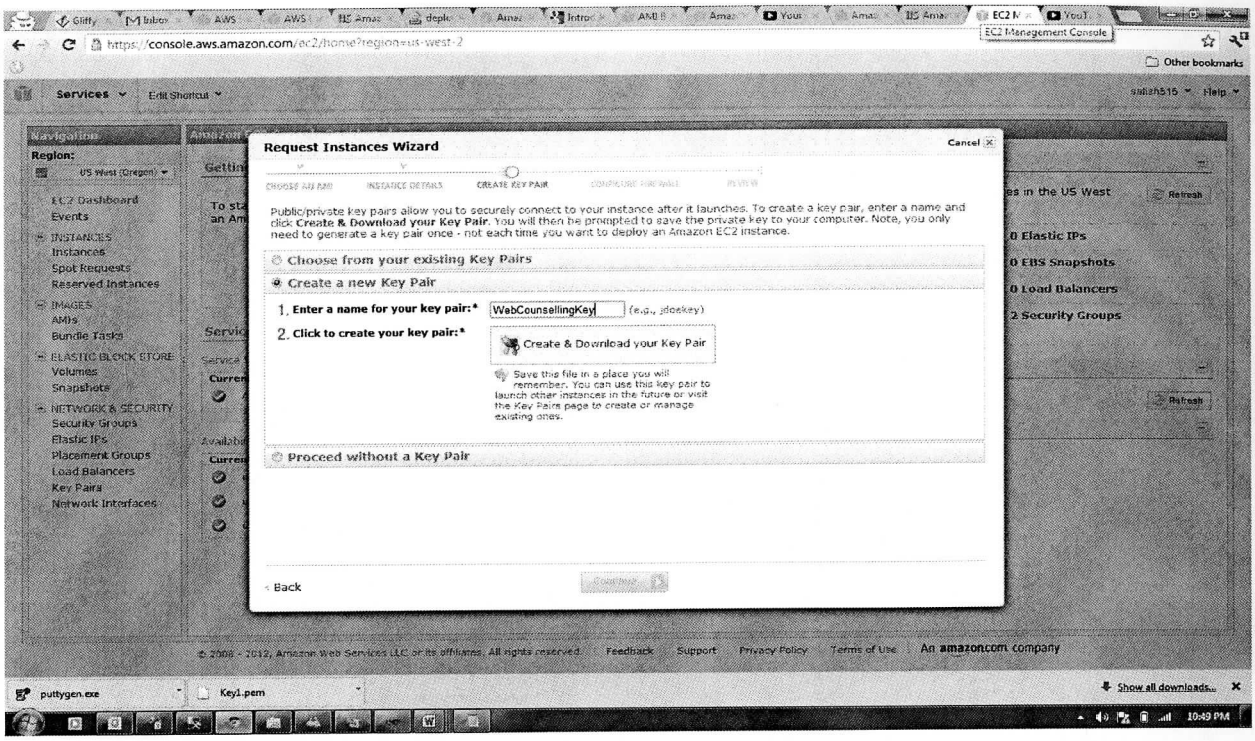

Figure 52 : Set existing key pair created for instance.

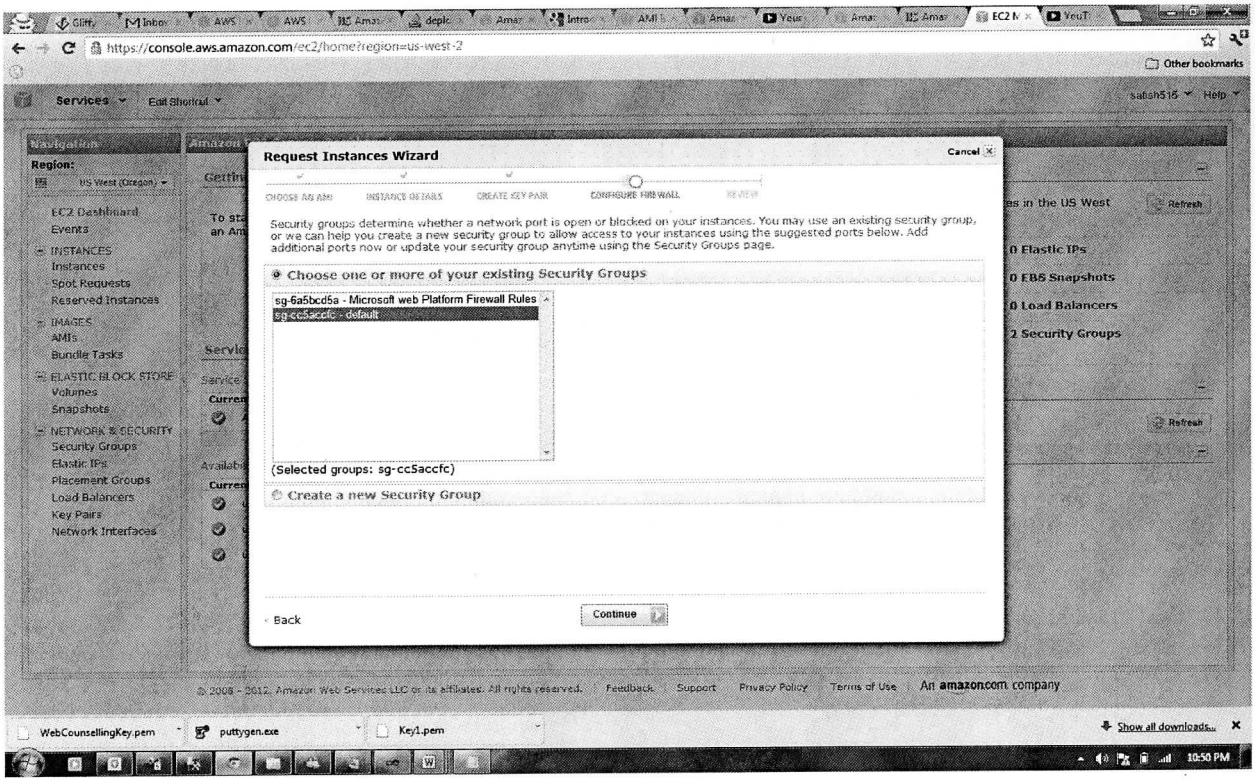

Figure 53 : Select security group.

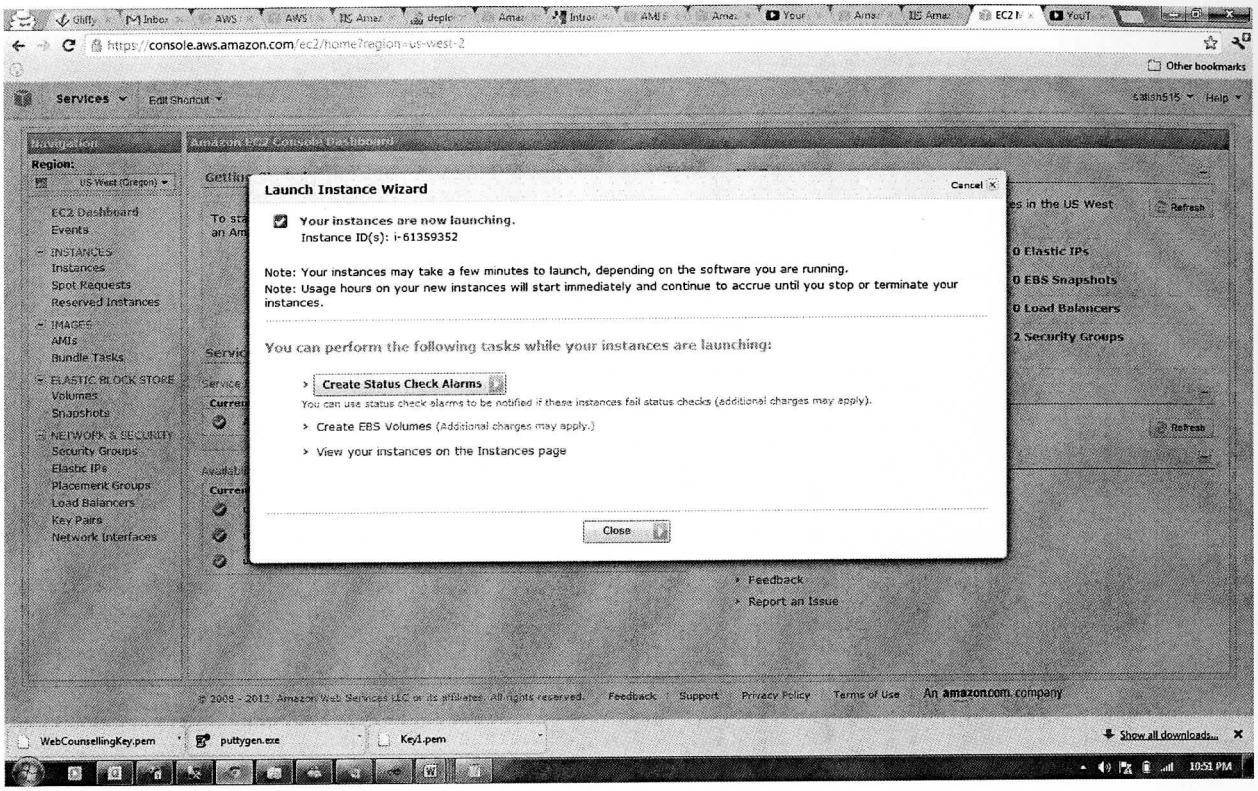

Figure 54 : Instance launched after associating key pair and security group.

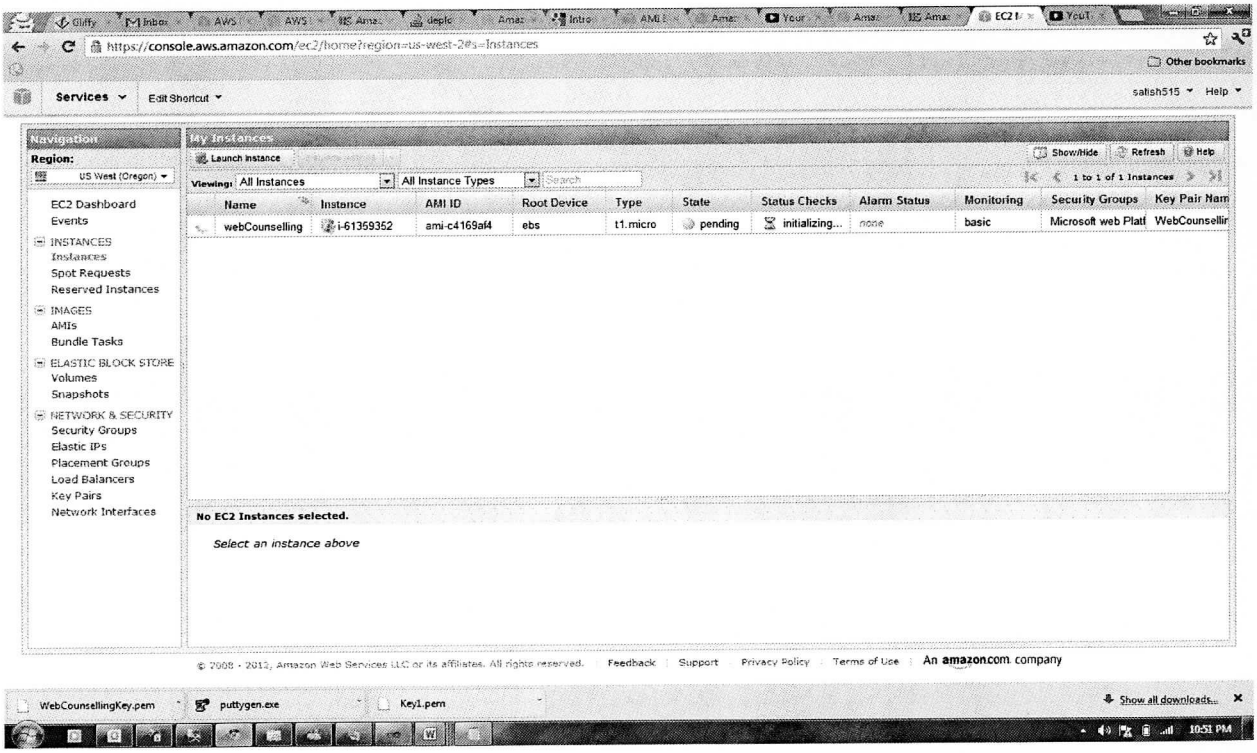

Figure 55 : Created instance in pending status.

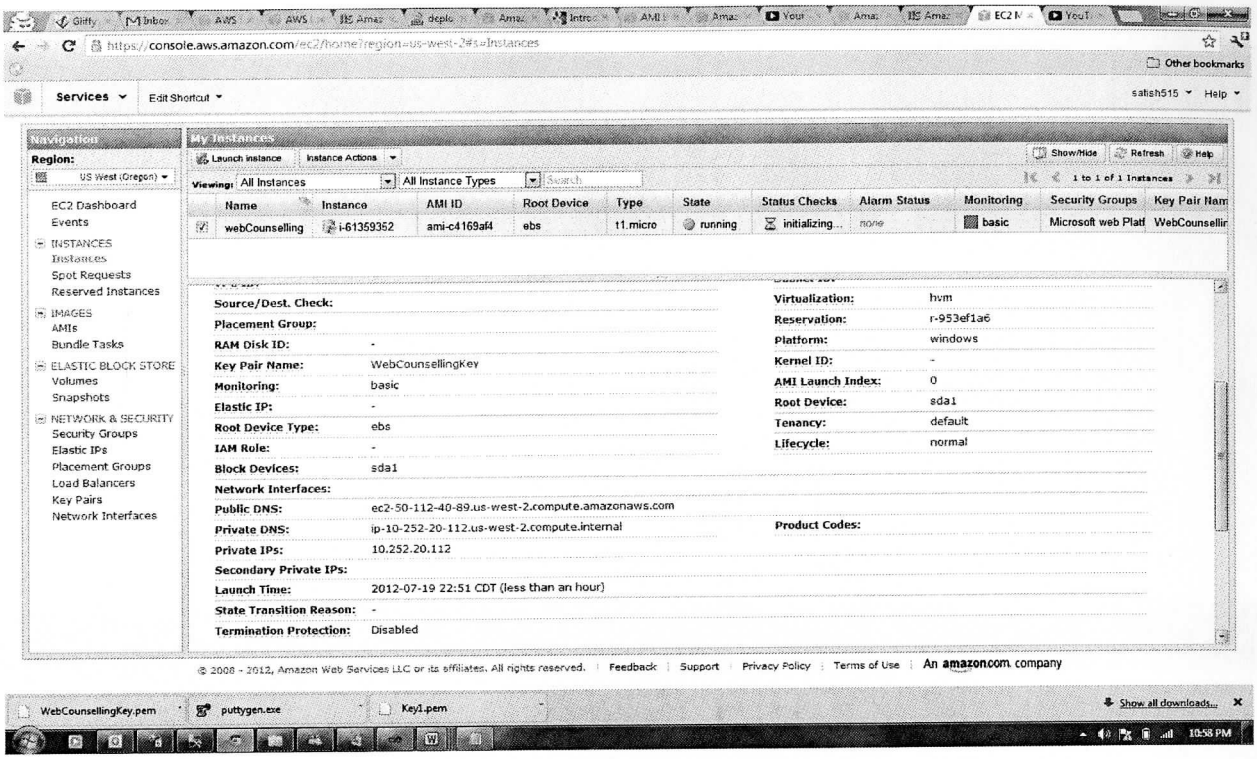

Figure 56 : Instance with updated status.

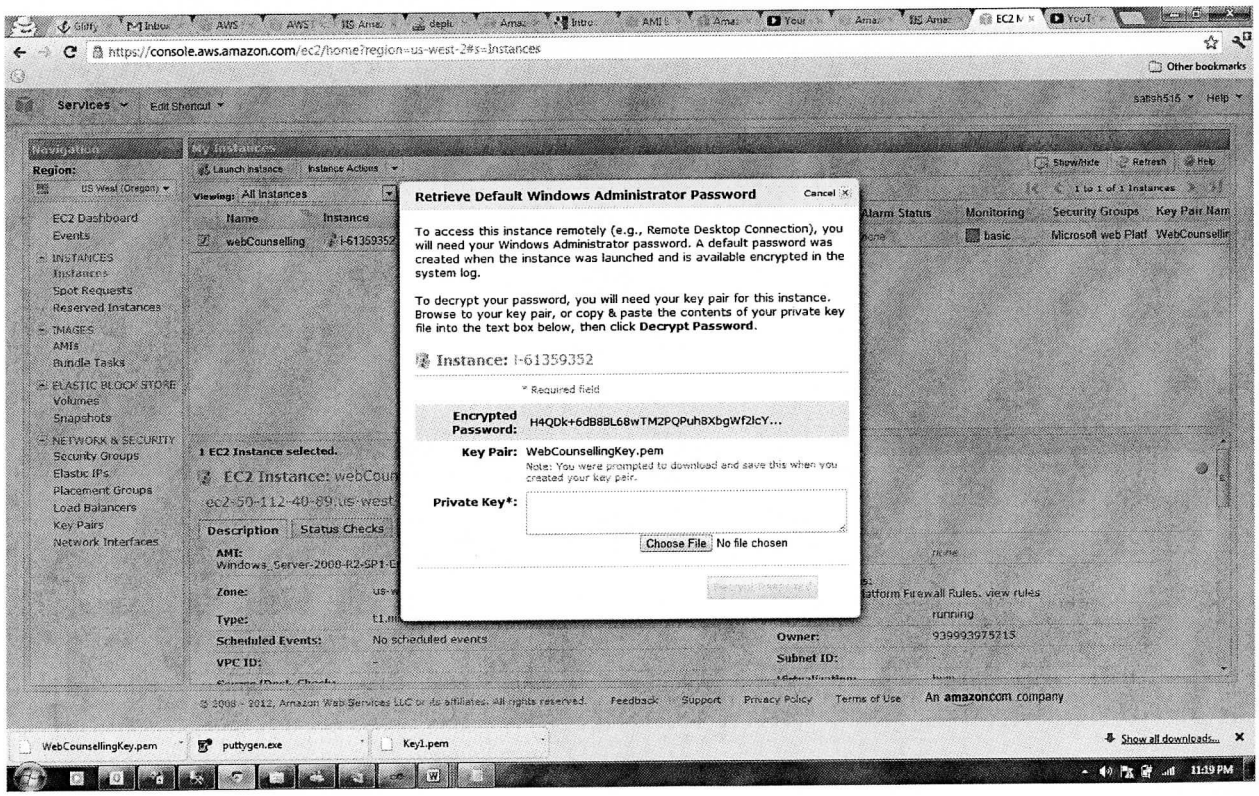

Figure 57 : Retrieve Administrator password by uploading key pair.

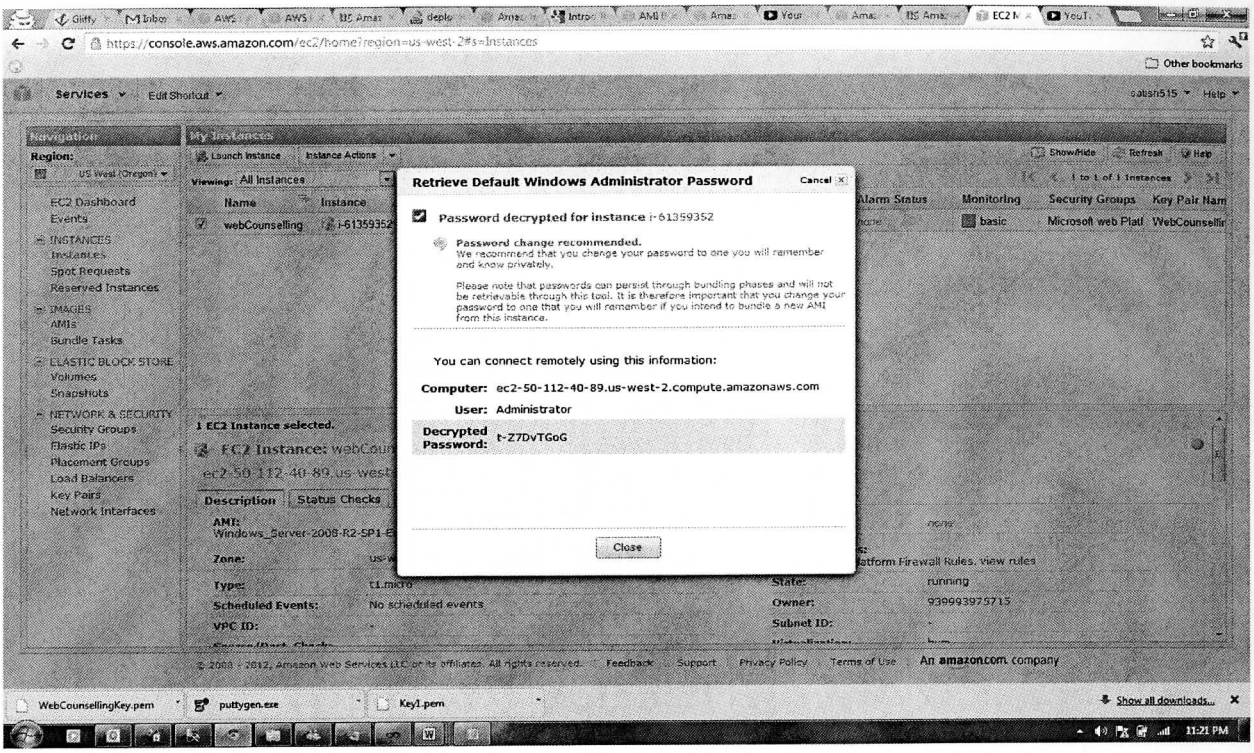

Figure 58 : Decrypted Password used at time of publishing application into server.

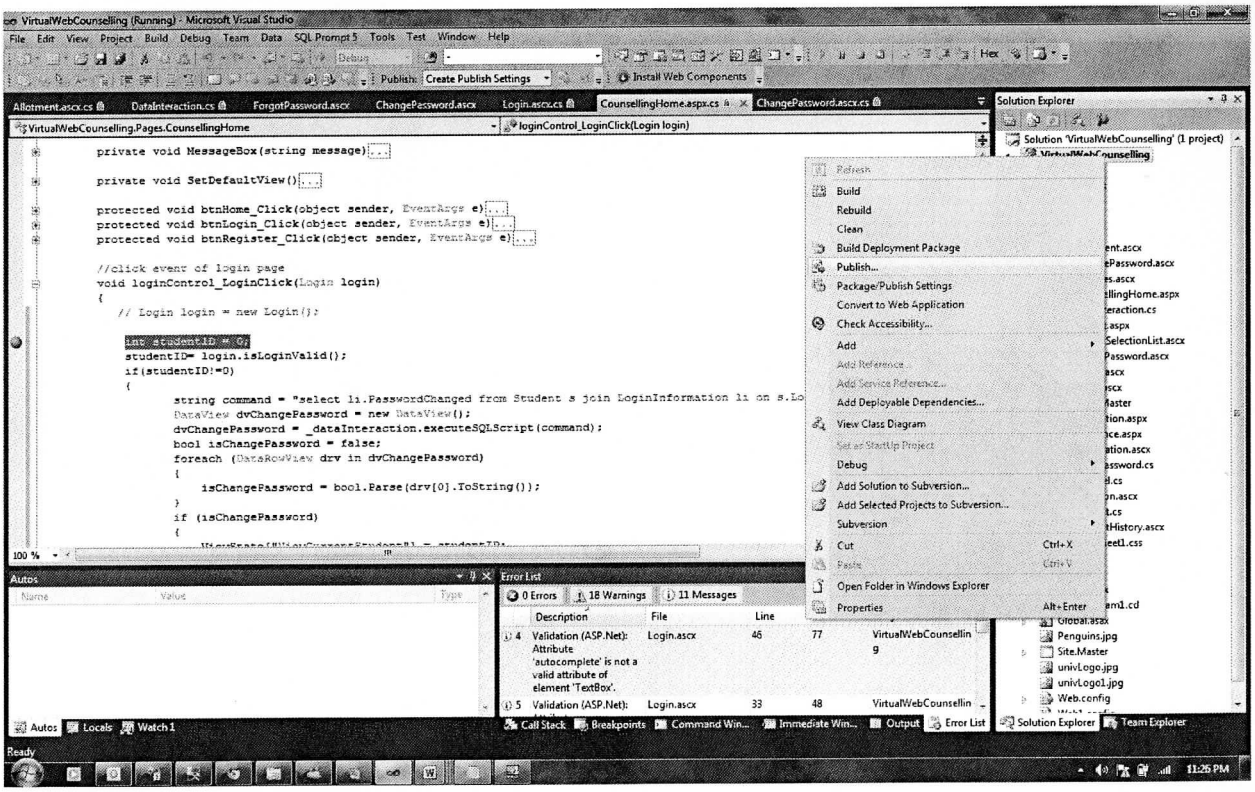

Figure 59 : Visual studios publish option.

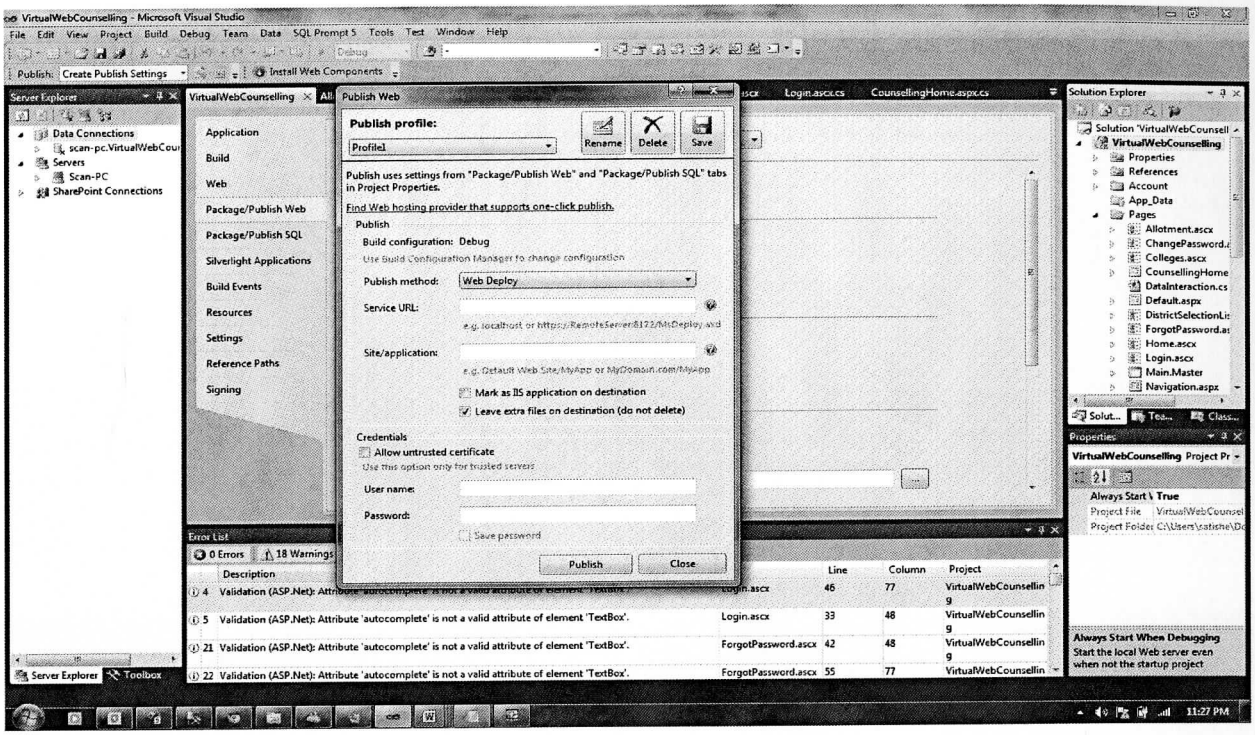

Figure 60 : Fill publishes profile tab with required information.

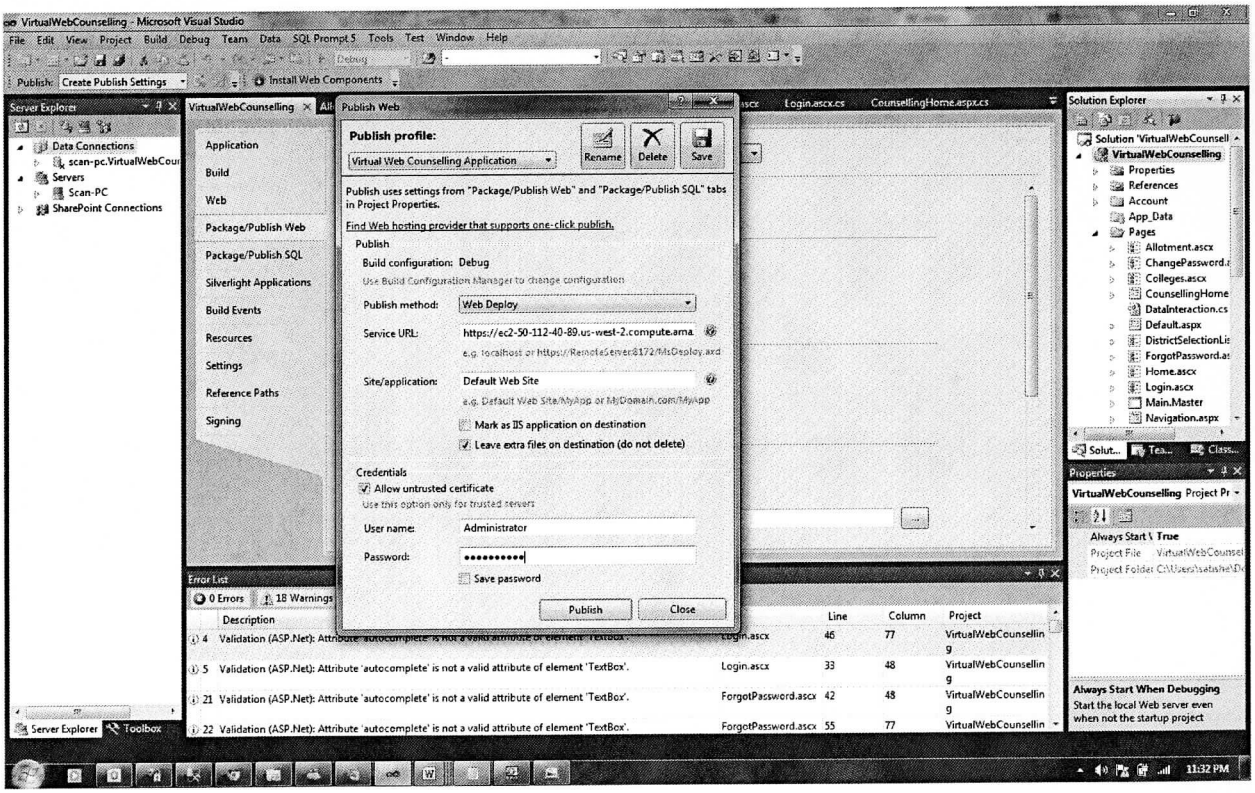

Figure 61 : Public DNS and other information added to publish.

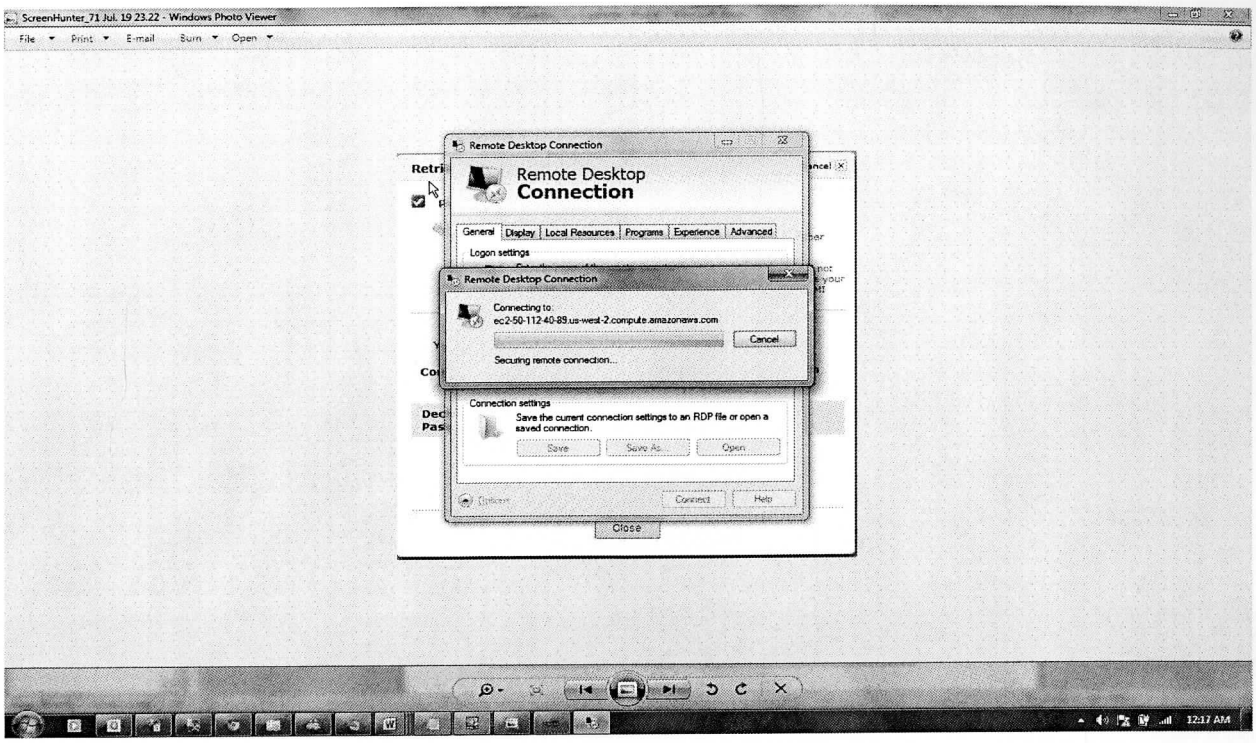

Figure 62 : Managing Remote desktop connection to serve using public DNS as IP address and decrypted password as credentials.

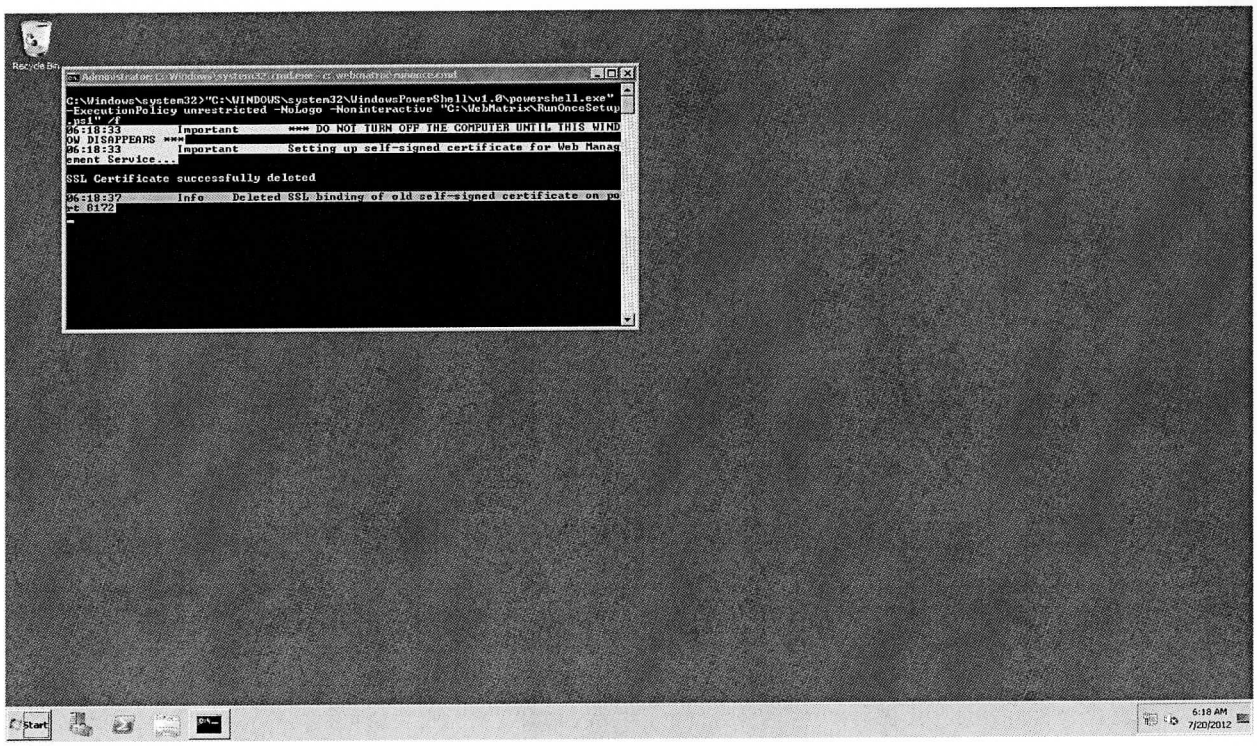

Figure 63 : Connected remotely to server in EC2.

CHAPTER 5

TESTING

5.1 Software Testing

The process of executing a software application or a program with the intent of finding errors is known as software testing. So the idea behind implementing software testing in our application is to identify software bugs or failures which can later be covered or fixed. Errors or bugs in a software application are always proportional to the size or complexity of the software. With the help of software testing it is not possible to determine that the application is working properly under all condition but instead it is possible to determine that the application is not working properly under certain test conditions.

The main purpose of conducting testing on a web application is to ensure that it delivers the required functionality or desired output. In this project as we are developing a web application, we conduct four different types of testing on our application they are

5.1.1 Unit Testing

Unit testing is performed by a developer at development level in his own environment. Each time a new code or web form is developed, unit testing should be performed to that code and then it should be deployed in the production environment. It is important for a developer to perform unit testing at the times of developing a new code with some functionality to make sure it delivers the estimated functionality. In our project which developing web counselling we perform this testing on login form, registration form, forgot password form with some input to determine the right functionality when submitted.

5.1.2 System Integration Testing

System integration testing as the name refers is a test environment where the code related to one application which is developed by many developers are integrated and deployed in it to ensure that the integrated application is working as whole together. So before deploying the code to the test severs each developer perform unit testing on their individual modules to make sure it does not affect the performance of the other developer's codes. Once the code is deployed in test sever different test case and test scripts are developed and tested here.

5.1.3 Performance Testing

Performance testing is the process of measuring the performance of the application under certain load. In particular for a web application performance plays an important role as the application will be used by multiple users at same time, it is important that the application always offer an acceptable level of performance on different volumes of users.

5.1.4 User Acceptance Testing

As the name user acceptance testing refers this testing is performed by a real user to make sure the application is functioning as expected. Once the user tested the application on all possible test condition an if the application is working properly the application will then is deployed to the production user and then finally users can access the application by its domain URL name.

Below are some test cases that were executed in system integration testing to test the functionality of the application.

5.2 Login Screen

Table 1: Login test cases

Test Case ID	Test Case	Procedure	Expected Result	Actual Result
LS-1	Student enters invalid registration no and password.	1. Student accesses login page. 2. Student enters invalid login credentials and	Should not navigate to home or history page and should display invalid login	As expected.

		clicks login button.	error message.	
LS-2	Student does not enter any login details.	1. Student accesses login page. 2. Student clicks login button without entering any login credentials.	Should not navigate to home or history page and should display invalid login error message.	As expected
LS-3	Student enters valid login details.	1. Student accesses login page. 2. Student enters valid login credentials and clicks login button.	Should navigate to home or history page and should set current user details to its tab.	As expected
LS-4	Student enter valid login details but not eligible for current day counselling.	1. Student accesses login page. 2. Student enters valid login credentials and clicks login button.	Should navigate to home page but should not be able to continue counselling also the current user details need to be set.	As expected

5.2 Change Password Screen

Table 2: Change password test cases

Test Case ID	Test Case	Procedure	Expected Result	Actual Result
CPS-1	Student enters invalid current password.	1. Student accesses change password page. 2. Student enters wrong current password and clicks change password button.	Should not navigate to home page and should display invalid current password error message.	As expected.
CPS-2	Student enters valid current password and new password.	1. Student accesses change password page. 2. Student enters correct current password and new password and clicks change password button.	Should navigate to home page and should set current user details to its tab.	As expected

5.3 Forgot Password Screen

Table 3: Forgot Password test cases

Test Case ID	Test Case	Procedure	Expected Result	Actual Result
FPS-1	Student enters	1. Student accesses forgot	An email with new	As expected.

	invalid registration # or DOB or email.	password page. 2. Student enters wrong registration no or DOB or email and clicks reset password button.	password should not be sent to his email and error message should be displayed.	
FPS-2	Student enters valid registration no or DOB or email.	1. Student accesses forgot password page. 2. Student enters correct registration no or DOB or email and clicks reset password button.	An email with new password should be sent to his email and then password change message need to be displayed.	As expected

5.4 Registration Screen

Table 4: Registration test cases

Test Case ID	Test Case	Procedure	Expected Result	Actual Result
RS-1	Student does not enter any registration details.	1. Student accesses registration page. 2. Student clicks register button without entering any registration credentials.	Should not navigate to home page and should display invalid registration field's error message.	As expected.
RS-2	Student enters valid registration details.	1. Student accesses registration page. 2. Student enters valid details to register and clicks registration button.	An email with all registration details should be sent to his email and Should navigate to home or history page and should set current user details to its tab.	As expected
RS-3	Student does not enter email in valid format	1. Student accesses registration page. 2. Student enters email in invalid format and clicks registration button.	Should not register and invalid email error message should be displayed.	As expected
RS-4	Student does not enter date of birth in valid format	1. Student accesses registration page. 2. Student enters date of birth in invalid format and clicks registration button.	Should not register and invalid date of birth error message should be displayed.	As expected

5.5 Selection Screen

Table 5: Selection (regions, districts) test cases

Test Case ID	Test Case	Procedure	Expected Result	Actual Result
SS-1	Student does not select any districts to populate colleges list.	1. Student accesses selection page. 2. Student clicks continue counselling button without selecting any district from districts list.	Should not navigate to college's page and should display "select districts" error message.	As expected.
SS-2	Student selects districts to populate colleges list.	1. Student accesses selection page. 2. Student clicks continue counselling button with selecting multiple districts from districts list.	Should navigate to college's page and should display colleges and branch located in districts selected.	As expected

5.6 Colleges Screen

Table 6: Colleges selection test cases

Test Case ID	Test Case	Procedure	Expected Result	Actual Result
CS-1	Student does not select any colleges and branches for allotment.	1. Student accesses college's page. 2. Student clicks continue counselling button without selecting any college or district from colleges list.	Should not navigate to confirm college's page and should display "select colleges" error message.	As expected.
CS-2	Student selects multiple colleges and branches for allotment.	1. Student accesses college's page. 2. Student clicks continue counselling button with selecting multiple colleges and branches from colleges list.	Should navigate to confirm college's page and should display colleges and branch selected for final review.	As expected

5.7 Select Priority Screen

Table 7: Priority selection test cases

Test Case ID	Test Case	Procedure	Expected Result	Actual Result
SP-1	Student does not select any priorities for colleges or branches for allotment.	1. Student accesses allotment page. 2. Student clicks submit button without selecting any priorities for college or branches for allotment.	Should not allot college for a student and should display select priorities error message.	As expected.
SPS-2	Student assigns same priority for multiple colleges for allotment.	1. Student accesses allotment page. 2. Student clicks submit button by selecting same priorities for multiple college for allotment.	Should not allot college for a student and should display common priorities error message.	As expected
SPS-3	Student assigns unique priority for multiple colleges for allotment.	1. Student accesses allotment page. 2. Student clicks submit button by selecting unique priorities for multiple college for allotment.	Should allot college for a student based on its rules and then display allotment confirmation to user and also email allotment information to student.	As expected

CHAPTER 6

CONCLUSIONS

The web counselling application software is developed in C# .NET as its front end, SQL SERVER as back end. After the completion of development, each module in the program has undergone stringent testing procedures and then the system integration testing has been performed to integrate different modules and to verify that the application is functioning as expected.

As the software is a web application it was designed using rich styled controls which allowed us to design rich user interface with advanced UI controls. In additional to these features strong security was integrated to this application. The application stringent security features include deleting the browser cookies which can contain login or other user details after each successful logout and log unsuccessful login count once it exceeds the limit. Also the password created by the user is first encrypted using some encryption algorithms and then is stored into the database.

Future Enhancements:

In present scenario profile verification of the student is done at the college after the allotment process. In future this feature can be integrated into the web counselling application so that student can submit his educational qualification details and other required details in the application and can be verified immediately. Also at this point this application developed is completely dedicated to one university, but in future more than one university can be integrated into this application with different scope and functionality.

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